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Railway Mechanical Engineer

May
1945

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DET

for **LOWER truck
MAINTENANCE..**

**..EQUALIZE
BRAKE FORCES
BALANCE
TRUCKS..**

Specify

WINE

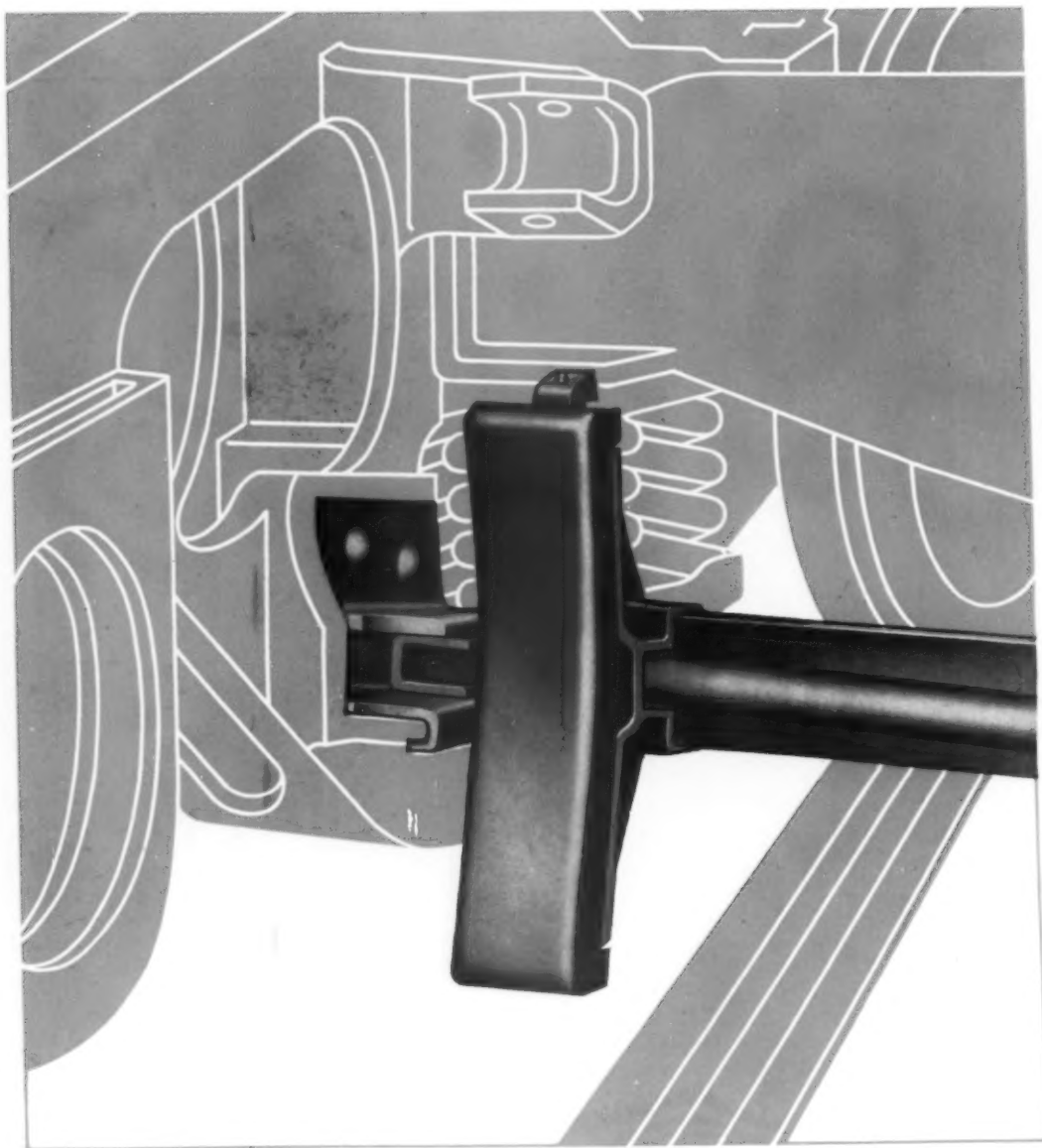


THE WINE
RAILWAY APPLIANCE CO.
TOLEDO, OHIO

**BRAKE
BALANCER**



UNIT TRUCK




Have You Seen Anything
Better?

UNIT TRUCK CORPORATION

140 CEDAR STREET

NEW YORK, 6, N. Y.

Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, \$3.00 for one year. U. S. and Canada. Single copies, 35 cents. Vol. 119, No. 5.



OAKITE "ON TIME" CLEANING

Helps you get POWER quickly back in service!

There are sound reasons why so many Mechanical Supervisors on Class I and Class II roads specify and requisition Oakite cleaning materials for maintenance, repair and overhaul jobs. These materials not only are economical, do each specific task thoroughly with required safety, but exacting tests also show that each operation to which they are applied is completed "on time",

And it is on this important factor of SPEED in cleaning which the experienced men comprising the Oakite Railway Service Division CONCENTRATE their efforts so as to help you get power back on the line . . . QUICKLY!

Trained Men, Well Grounded in Railway Maintenance, Ready to Help You

Put successful, shop-tested Oakite materials and methods to work on your road. Along with them go a practical, competent personal service that assures selection of the correct material for each individual job, based on your current operating conditions. This extra no-cost Oakite Service is never included in specifications . . . it is only shown and measured in the RESULTS you obtain . . . in the time and money savings it makes possible. Since this Service is freely available at all railway divisional points . . . won't you take full advantage of it for YOUR road?

OAKITE PRODUCTS, INC., WRIGLEY BUILDING, CHICAGO 11, ILL.

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23

Maintenance Jobs Oakite Materials
Can Help You Handle Easier:

- Cleaning Air Filters
- Air Conditioning Equipment
- Running Gear, Steam-Detergent
Cleaning
- Running Gear, Solvent-Detergent
Cleaning
- Descaling Diesel Cooling Systems
- Cleaning Oil Coolers
- Descaling Feedwater Heaters,
Injectors
- Cleaning Locomotive, Coach and
Freight Car Trucks
- Cleaning Side Rods and Valve Gear
Before Magnaflex Test
- Washing Engine Jackets, Cabs,
Tenders
- Back Shop Tank Degreasing
- Cleaning Air Compressors
- Cleaning Diesel Cylinder Heads,
Liners, Pistons, Etc.
- Safety Washing Streamliners
- Stripping Paint from Tenders, Freight
Cars and Coaches
- Cleaning Journal Boxes, Brake Shoes
- Degreasing Driving Box Lubricators
- Cleaning Locomotive Frames
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and Refrigerator Cars
- Stripping Varnish from Armature
Coils
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for Plating

OAKITE

RAILWAY SERVICE DIVISION

PUT THIS

AIR-FORCE

TO WORK

Thor Pneumatic Tools
Speed Heavy-Duty Jobs

The effective force which can be applied to a job by air with Thor Pneumatic Tools has special advantages. Accurately controlled speed utilizes power with high efficiency. Especially in cramped quarters will Thor Tools get work done—even heavy-duty drilling as illustrated above. If your production could use this extra force check into the pioneer line, featuring low-maintenance. Write for Thor Catalog No. 52B.

Thor PORTABLE
Pneumatic
TOOLS



Thor Pneumatic Drills offer over 90 models and sizes. Type illustrated is a Thor Close Corner Drill. Capacities 9/16" to 2".



Thor Rotary Air Grinders in 50 portable sizes offer models for a wide range of grinder jobs. Available with straight, grip, or lever throttle.



Thor Screw Drivers and Nut Setters in 40 add air-driven models are known throughout industry for fast, evenly-controlled action and the uniform tension applied. A complete line of attachments and accessories adapt these tools to all classes of work.

INDEPENDENT PNEUMATIC TOOL CO.

600 W. Jackson Blvd., Chicago 6, Illinois

New York

Los Angeles

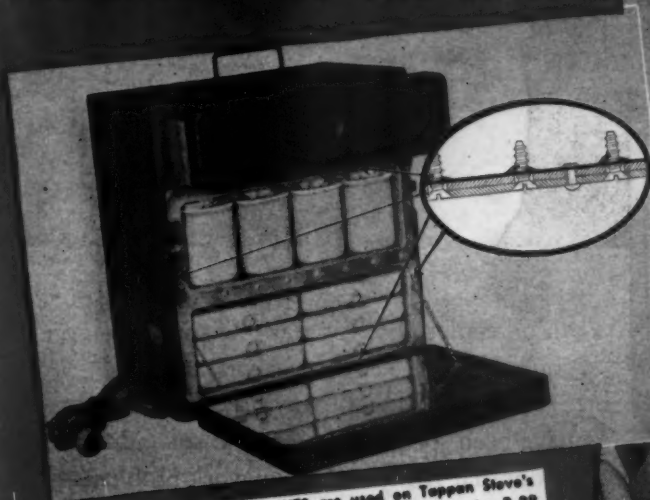
RAILWAY MECHANICAL ENGINEER

MULTIPLE AND TWIN SPEED NUTS

Combine

FASTENERS INTO ONE UNIT!

Illustration shows use of Twin SPEED NUT for attaching bracket to aircraft fuselage frame. Applied faster, reduces number of parts, and prevents vibration loosening.



Four Multiple SPEED NUTS are used on Toppan Stove's food warmers, now standard equipment on the B-29 Super Fortress. Only 10 rivets necessary to hold all 4 SPEED NUT strips for blind attachment of liner to cabinet.



Individual SPEED NUTS offer tremendous advantages over ordinary fasteners, but Twin and Multiple SPEED NUTS go even further. They COMBINE two or more SPEED NUTS into one unit to simplify, reinforce and speed up multiple fastening attachments.

Twin type SPEED NUTS are available with $\frac{1}{2}$ " to 1" hole spacings, for machine screws or sheet metal screws. Center hole in SPEED NUT per-

mits riveting in place for blind location assembly.

Multiple type SPEED NUTS are available with 1" to 2" hole spacings, for 6Z, 8Z or 10Z sheet metal screws. Supplied in any desired lengths or in coils. Made of spring steel for riveting in blind location, or stainless steel for welding. In writing for samples, please give screw size and hole spacing.

TINNERMAN PRODUCTS, INC.

2029 FULTON ROAD, CLEVELAND 13, OHIO

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario

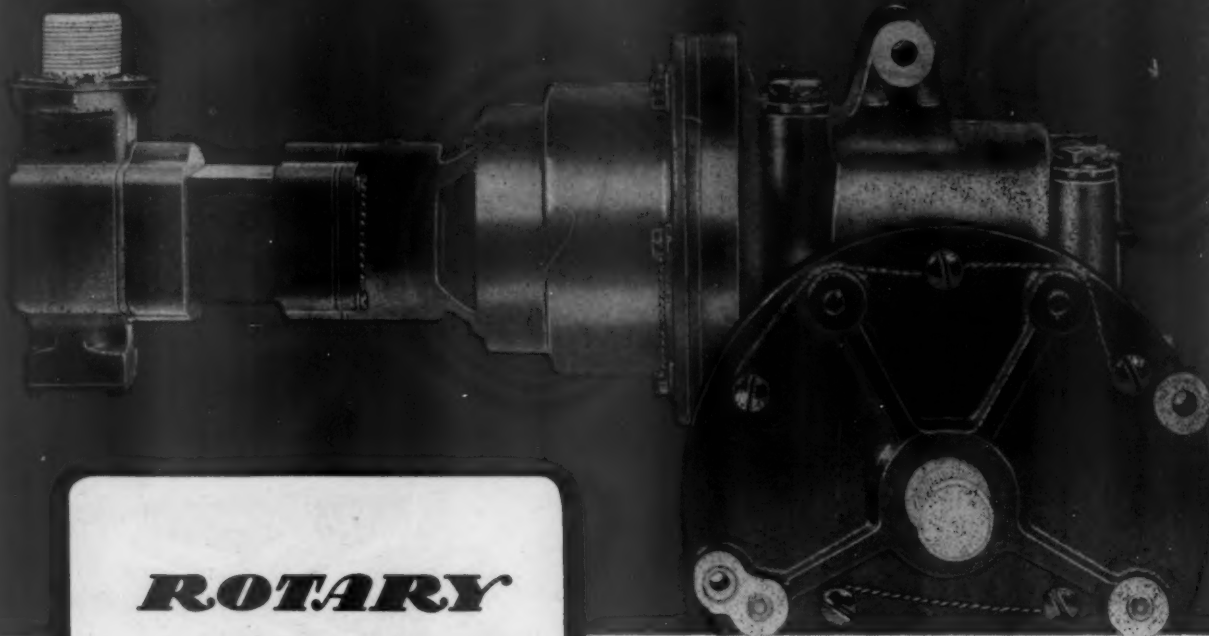
In England: Simmonds Aerocessories, Ltd., London



THE BASIC PRINCIPLE of Spring-Tension Lock is Embodied in all Speed Nut Designs

Speed Nuts
PATENTED
FASTEST THING IN FASTENINGS

*Trade Mark Reg. U. S. Pat. Off.



ROTARY ACTUATOR

Designed from the ground up to meet exacting specifications as to size, weight, mounting conditions, work output as well as manufacturing production, this EEMCO rotary actuator illustrates how man is making greater use of the flexibility of electric power.

For the record, this completely self-contained drive unit consists of a thermally protected eighth hp motor, equipped with magnetic clutch and brake. Compound planetary and worm and sector gearing provides a reduction of approximately 15,000 to 1. Maximum torque on the drive shaft is 6,000-inch-pounds. Output speed is 5/10 rpm. Wound for a 28-volt system. Used to actuate

an oil cooler door for wartime transportation equipment.

This and many other motor drives have been specially designed to solve difficult or unusual Army and Navy work problems—for remote control—for instrument drive—for powering fuel pumps—for opening doors—for mechanical actuation—for continuous or intermittent duty. Splash proof and explosion proof designs also perfected.

Let EEMCO engineers go over your toughest wartime motor needs now, and later, when the urgency of war is past, submit designs for custom built electric drive units for your special peace-time operations or developments.



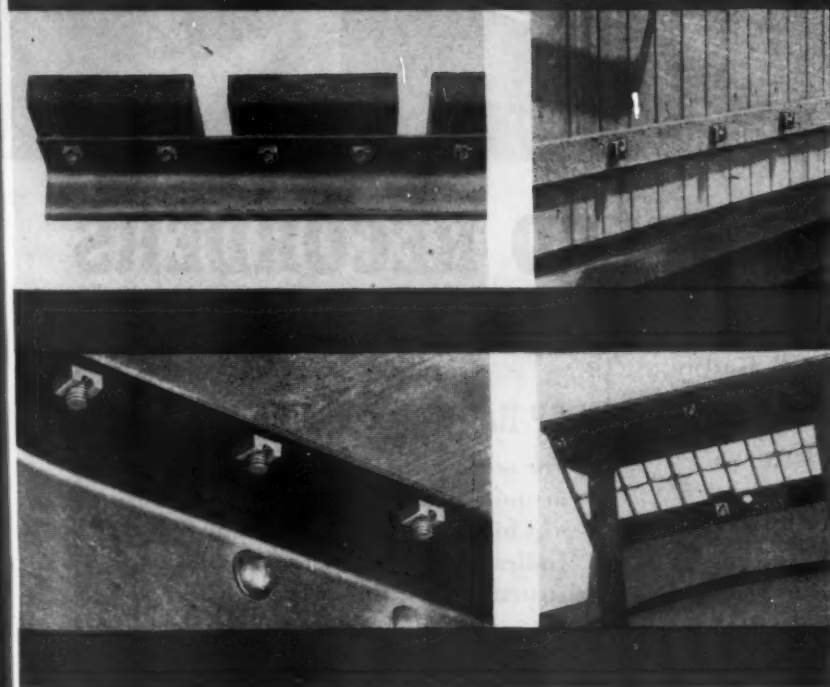
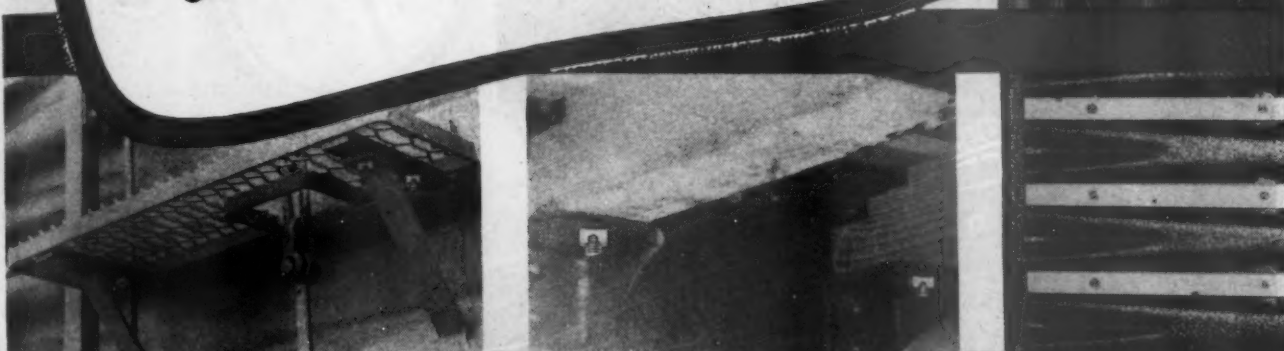
Send in your reservation today for "Custom Built Motors for a World of Needs." Copies of this limited edition will be distributed only on written request.

EEMCO

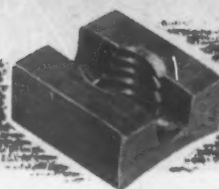
ELECTRICAL ENGINEERING AND MFG. CORP.

4606 West Jefferson Boulevard, Los Angeles 16, California

Where to Use
"M-F" Speed LOCK NUTS
on Freight Car Bodies



*M-F Lock Nuts fill every bolting requirement
in freight car construction*



Routing & defect card boards
Bolts holding furring in corruga-
tion of steel ends
Door post bolts
Corner post bolts
Sub-roof bolts
Composite door construction
Door fixtures where bolted
Side lining furring—steel box cars
Side and end sheathing—single
sheathed box cars and composite
gondola cars
Framing, furring, sheathing straps,
and side, end, and top plate filler
—double sheathed box cars
Slats and End Lining—Stock Cars
Refrigerator car framing and mis-
cellaneous nuts in interior of car
body, particularly those con-
cealed in the walls of the car

MACLEAN-FOGG LOCK NUT COMPANY

2649 N. Kildare Avenue, Chicago 39, Illinois • In Canada: The Holden Co., Ltd., Montreal

May, 1945

***For High Speed
and
Low Speed Service***



CP RAILWAY SPEED RECORDERS

PERFORMANCE charts of CP Railway Speed Recorders provide a permanent record of running speeds and distances traveled, together with acceleration, deceleration, forward-backward movements, and slippage. CP Railway Speed Recorders are available in two models: CP High Speed (10 to 120 mph) Recorders; CP Low Speed (0 to 75 mph) Recorders. Both models furnished in friction or angle drive to meet specific types of locomotive construction. Write for Bulletin 841.

CP Railway Speed Indicators

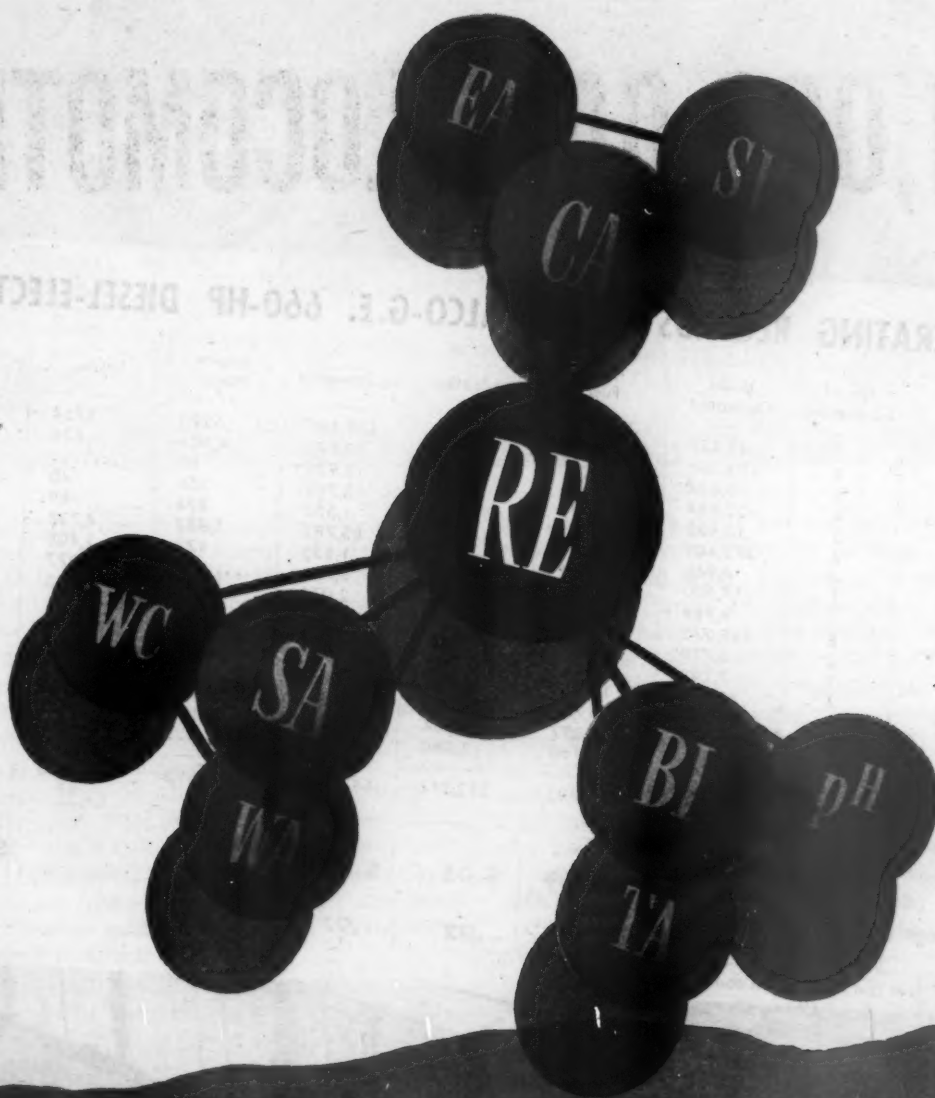
For service where permanent records are not required, there are two models of Chicago Pneumatic Railway Speed Indicators. These are identical in construction with the CP Speed Recorders — but without recording charts.

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★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES



THIS IS WHAT HAPPENS WHEN YOU WASH A LOCOMOTIVE

Correctly cleaning a locomotive is no simple operation... these elements must go into action...

Wetting Action (WA) must lower surface and interfacial tensions and allow the cleaning solution to penetrate to surface of the base. Emulsifying Action (EA) must disperse grease and oil as tiny globules, and by suspension prevent redeposition. Saponifying Value (SV) must convert organic fats and oils into soluble soaps, and Solvent Action (SA) put soils into solution. Colloidal Activity (CA) must disperse solid soils into minute particles which may then be easily removed. Water Conditioning (WC) removes or controls the elements which cause water hardness.

Correct Buffer Index (BI) assures ability to absorb either alkaline or acid soil, thus prolonging efficiency of the solution. Proper pH assures the correct measure of energy of alkalinity and Total Alkalinity (TA) must supply maximum active cleaning energy.

In formulating a cleaning compound, therefore, it is obvious that no one factor is a magic key to all problems. The answer is in determining the relative value of all these factors as they apply to your problem.

Putting these factors into correct balance is a responsibility you can entrust to Turco chemists—a responsibility for which their two decades of Research and Experience (RE) have well qualified them. Take your problem to Turco.

For a fuller explanation of these vital factors, write for Turco's Booklet on your firm letterhead, please.



TURCO

INDUSTRIAL CHEMICAL COMPOUNDS

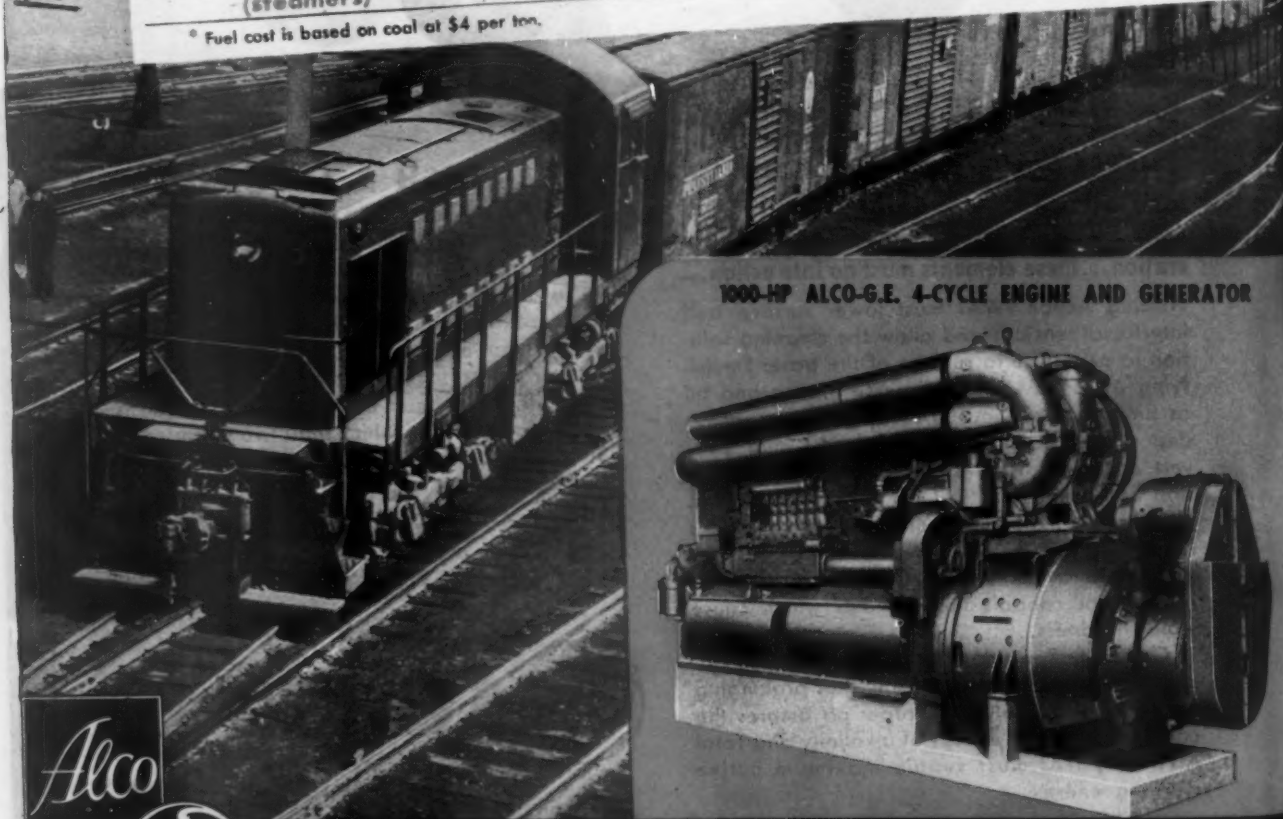
TURCO PRODUCTS, INC. Main Office and Factory: 6135 S. Central Ave., Los Angeles 1, Calif. • Southern Factory: 1606 Henderson St., Houston 1, Texas • Chicago Office and Factory: 125 West 40th Street, Chicago 9 • Offices and Warehouses in All Principal Cities

1,000,000 LOCOMOTIVE-

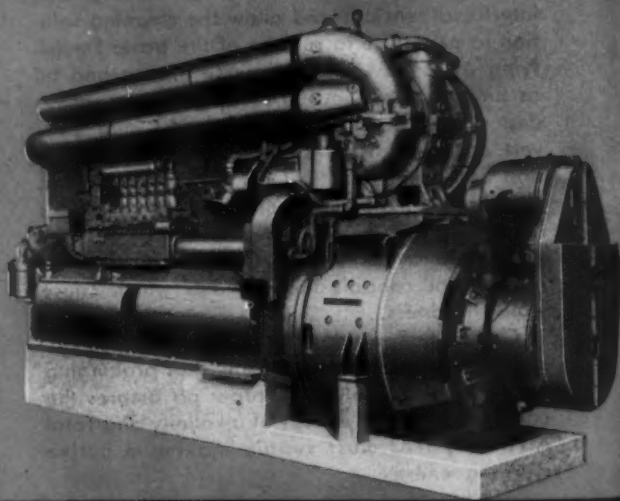
OPERATING RECORDS OF 54 ALCO-G.E. 660-HP DIESEL-ELECTRICS

RR	No. of Locomotives	Hours Operated	Fuel	Lubrication	Maintenance	Engine House	Misc.	Total
A	3	49,477	\$14,922	\$2,549	\$23,483	\$220	\$754	\$41,928
B	3	103,506	33,251	7,577	40,893	4,606	636	86,963
C	1	15,634	4,711	767	2,929	80	.....	8,487
D	4	32,884	8,405	964	3,702	556	40	13,667
E	2	10,622	3,562	201	1,552	324	89	5,728
F	8	272,409	70,968	12,675	83,782	5,087	4,738	177,250
G	4	6,940	1,594	170	1,165	173	1,408	4,510
H	1	17,500	5,864	576	5,758	.....	277	12,475
I	1	9,794	3,948	544	2,070	487	133	7,182
J	8	229,272	79,569	10,681	126,217	.....	.....	216,467
K	2	4,719	1,531	154	577	12	19	2,293
L	1	7,798	3,873	383	7,672	4,733	306	16,967
M	1	46,127	18,345	6,148	43,660	333	641	69,127
N	10	128,259	33,723	4,331	45,698	5,254	671	89,677
O	4	88,363	28,277	3,934	32,216	2,127	1,473	68,027
P	1	28,503	13,160	1,060	11,927	.....	478	26,625
TOTAL	54	1,051,807	\$325,703	\$52,714	\$433,301	\$23,992	\$11,663	\$847,373
Average cost per locomotive-hour (diesel-electrics)			\$0.309	\$.05	\$.412			\$0.806
Average cost per locomotive-hour (steamers)			1.11*	.02	.97			2.765

* Fuel cost is based on coal at \$4 per ton.



1000-HP ALCO-G.E. 4-CYCLE ENGINE AND GENERATOR



Alco



AMERICAN LOCOMOTIVE

HOURS ON 16 RAILROADS...

prove fuel and maintenance costs of Alco-G.E. units are 65% less than those of steamers

THE operating records of 16 railroads (covering 54 Alco-G.E. 660-hp units over periods as long as eight years) reveal fuel costs that average less than one-third, and maintenance costs that average less than one-half, those of five-year-old steamers doing similar work. The total of all locomotive operating expenses, less wages, of these 54 diesel-electrics averages only 30 per cent of the same costs of steamers.

One reason why savings are so high with Alco-G.E. diesel-electrics is that each component is specially designed for operating economy. For example, the 4-cycle engine has these advantages:

1. LOW FUEL CONSUMPTION. Cylinder pressures and temperatures are inherently low, reducing the possibility of blow-by and incomplete or premature combustion—all of which waste fuel.

2. LESS MAINTENANCE. A reversal of load, which allows both sides of the piston pin to be thoroughly lubricated, lengthens the periods between recommended inspections to two years, or 16,000 hours of operation.

3. LONG ENGINE LIFE. There is no overheating and weakening of engine parts nor rapid oxidation of

lubricants—the three strokes between combustion strokes allow ample time for cooling.

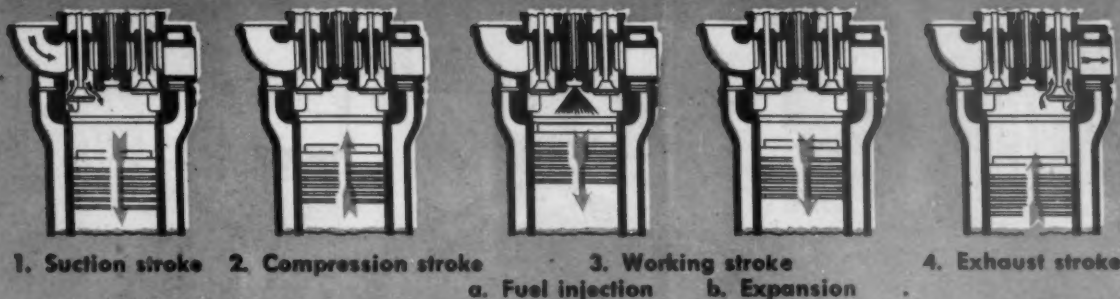
4. LESS LUBE OIL USED. The cylinder liners, which receive the brunt of engine wear, are smooth, perfectly symmetrical and portless; this prevents ring sticking, sludge deposits, and varnishing which increase lubricating oil consumption.

In addition to providing operating economies, these advantages of Alco-G.E. diesel-electrics also account for their higher-than-average availability and "use-ability." On one eastern road, where eight units are averaging 98.7 per cent availability, the utilization factor is 87.3 per cent, and the locomotives still have extra locomotive-hours available for emergency work.

These results are typical. What Alco-G.E. diesel-electrics can do for you can best be determined by a motive-power survey for which we offer the services of our engineers. Our recommendations will be impartial. We build all three types of motive power—diesel-electric, electric, and steam.



STEP-BY-STEP OPERATION OF THE ALCO-G.E. 4-CYCLE ENGINE



1. Piston descends and draws air into the cylinder through the inlet valve. 2. Piston ascends with all valves closed and compresses the air. 3. Piston descends. First (a), fuel enters and ignites. Second (b), after

about one-tenth of the stroke, fuel valve closes, and the burning mixture expands. 4. Piston ascends and expels burnt gases through the exhaust valve.

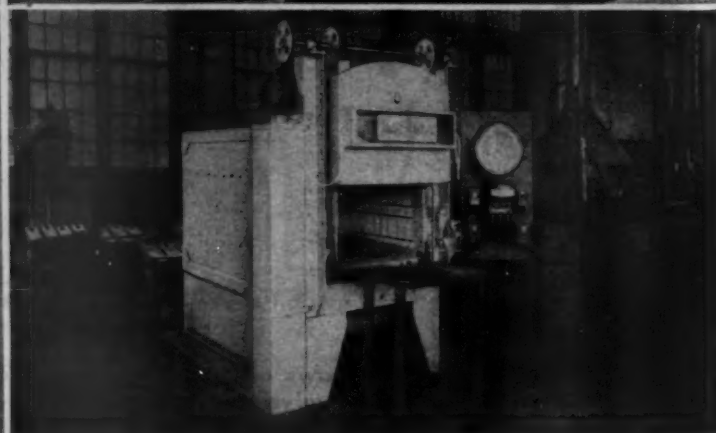
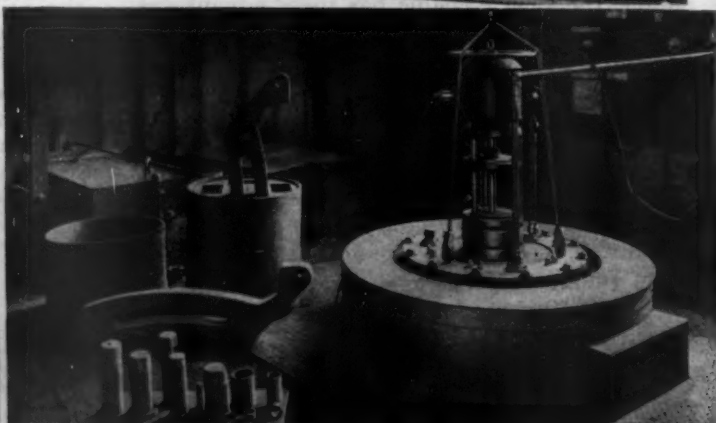
and GENERAL ELECTRIC

111-128-9600

THE IMPORTANCE OF ADEQUATE WORK EQUIPMENT...

Nothing has emphasized the importance of adequate work equipment as has the man power shortage. With the tremendous overload in maintenance shops today, modern machinery alone can cope with present conditions and the post war rehabilitation program.

Heat treating is an important operation in maintainance work and many railroads are replacing their obsolete furnace equipment with modern HEVI DUTY precision electric heat treating furnaces. Bulletin HD-444 details your furnace for your needs — send for your copy — today.



HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI DUTY ELECTRIC EXCLUSIVELY
MILWAUKEE WISCONSIN

EVERYTHING for your Spring shop



YOU CAN put a "shop within a shop" with this comprehensive group of Watson-Stillman hydraulic machines for spring working. These machines round out a line of hydraulic spring shop equipment that offers high efficiency and low maintenance values in self-contained, quick-acting, oil-operated units.

Count on these Watson-Stillman machines to make your shop run as smoothly as rail traffic rides on correctly repaired springs. Count on W-S to embody in them the experience and first-hand knowledge gained by nearly a century of intimate association with modern railroad shop practices.

For information on this spring shop equipment send for Bulletin No. 550-A. For information on other efficient W-S railroad products, write, outlining your problems and needs, to The Watson-Stillman Company, Roselle, New Jersey.



WATSON-STILLMAN

Designers and Manufacturers of Hydraulic Equipment,
Forged Steel Fittings and Valves

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CANADA: Canadian Fairbanks-Morse Co., Ltd. • Branches in All Principal Cities

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5 TON

CYLINDER HEAD

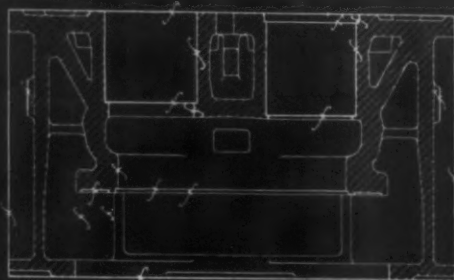
G. & L. Horizontal Boring Machine Proves Only Practical and Economical Method to Use for Boring, Drilling and Milling Huge 6 Faced Casting...

● Here is a 10,000-lb. cast-iron Cylinder Head for a Diesel engine, requiring diversified machining operations on each of six faces. All dimensions must be held to close tolerances with tapped holes, bores and machined surfaces in correct alignment to meet assembly requirements.

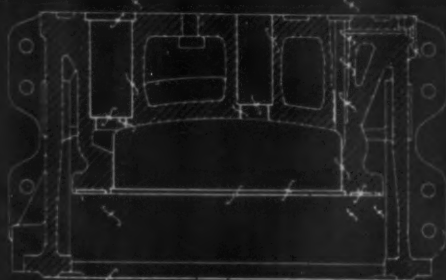
The manufacturer states that "the only practical method of doing this job is to machine it completely on the G. & L. Horizontal Boring Machine." He claims that "due to the pressure of production this cylinder head must, at times, be routed over several machines to relieve the load on the Horizontal, but nevertheless, the best and only economical method for us is to do all the work on our G. & L."

The flexibility, capacity, working range, simplicity of setting the work, accuracy, convenience of scales and verniers, micrometer dials, etc., all contribute in making the G. & L. Horizontal Boring Machine one of the most practical and economical machines in shops with large complex work.

In your own plant you may be producing work on more than one machine which can be handled faster and at less cost on a Giddings & Lewis Horizontal Boring, Drilling and Milling Machine. Our engineers will gladly assist you in analyzing and solving difficult machining problems.



Vertical cross-section through center of cylinder head with machining indicated.



Horizontal cross-section through center and end view with machining indicated.



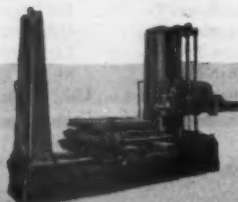
Top view of cylinder head casting showing detailed character of machining operations.



Right: G. & L. Table Type Machine.

GIDDINGS & LEWIS

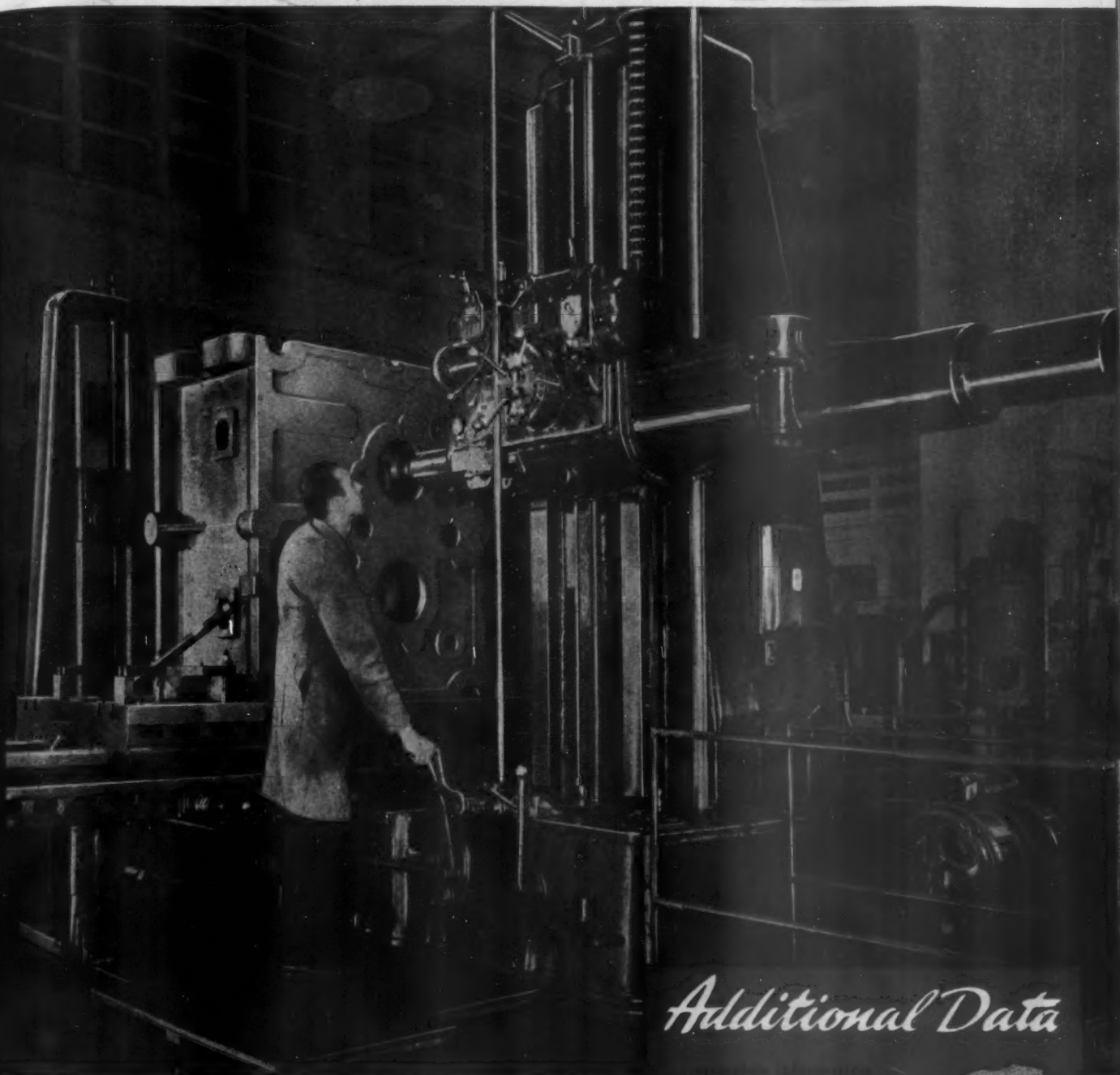
150 DOTY STREET



Right: G. & L. Floor Type Machine.



SET UP AND MACHINED IN **40** HOURS

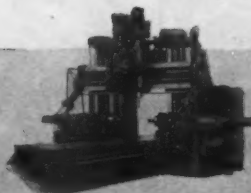


No. 350-T G. & L. Horizontal Boring Machine with extended saddle, saddle supports and auxiliary runways used to machine 5-ton cylinder head.

MACHINE TOOL CO.
FOND DU LAC, WIS.



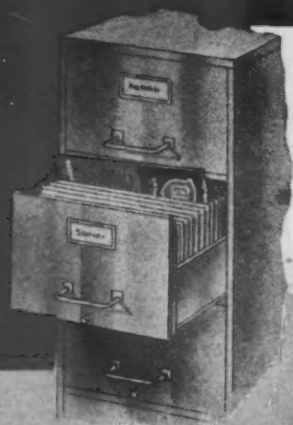
Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.

Additional Data

Complete information available on Giddings & Lewis machines, tools, accessories, and equipment. Write for Bulletin No. 111111 or for. Please indicate your business location.



BULLARD



Cut Master

V.T.L.

CUTS REPAIR COSTS ON MODERN POWER..

RAILROAD shop supervisors familiar with Vertical Turret Lathes will quickly recognize the many profit-paying features built into BULLARD Cut Masters.

These machines are massively constructed and assure the necessary rigidity under heavy cuts of all heads simultaneously. Screw feeds of the main heads provide a high degree of accuracy. Speeds and feeds available provide for the most efficient use of modern cutting tools.

One of the latest railroad shop installations is a 74" Unit illustrated on the facing page. This big Cut Master is used on all types of jobs for electric and Diesel-electric power. One view shows the machining of 62" tires and the other shows facing operations on a big motor housing.

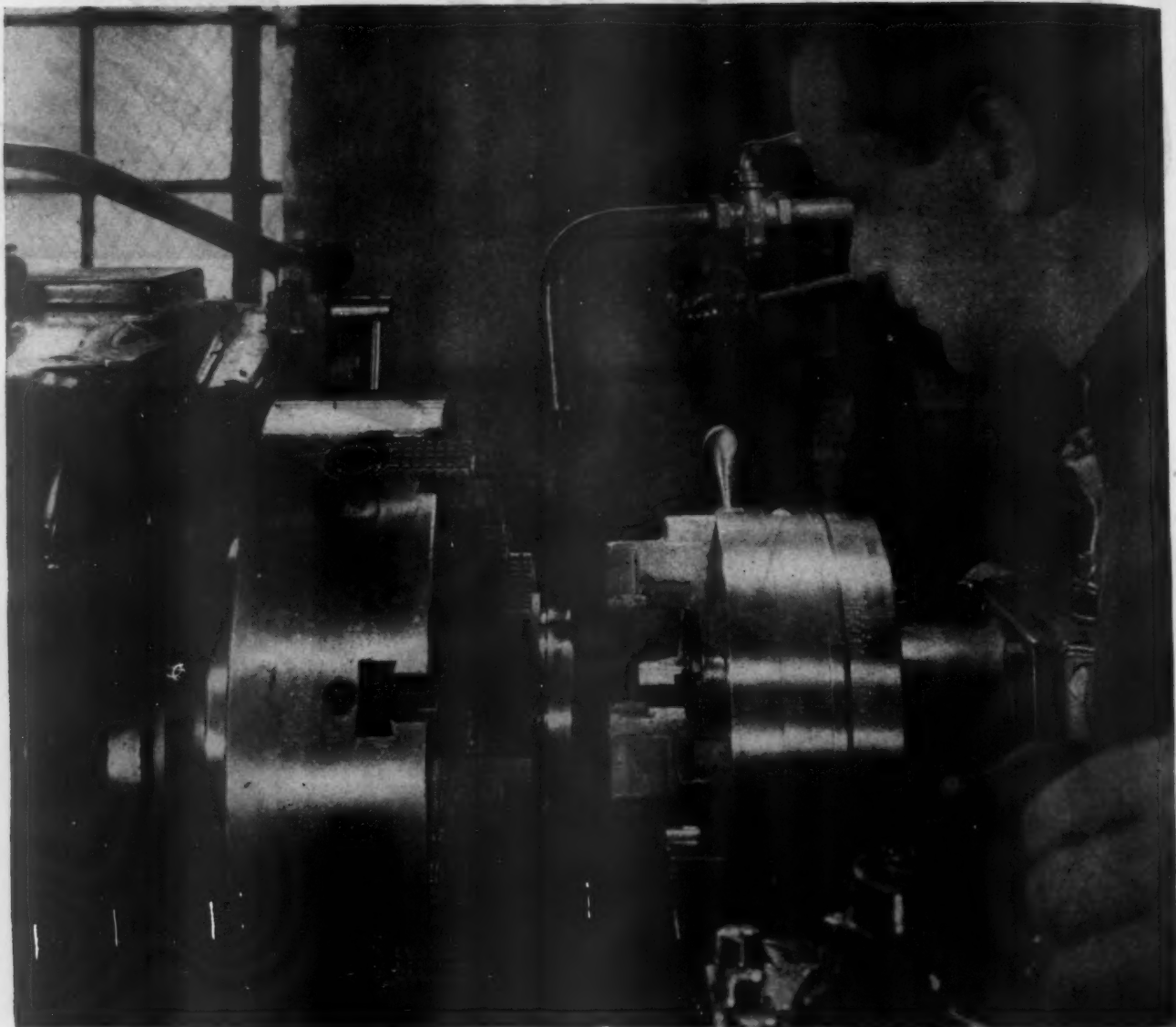
BULLARD Cut Masters can be furnished in six different sizes — 30", 36", 42", 54", 64" and 74"—you have your choice of six different head combinations on the four larger sizes.

Plan to modernize your shop. Speed up your jobs — lower your costs by utilizing the production economies built into BULLARD Cut Master Vertical Turret Lathes. Specify Bullards on your buying program.

Send for Bullard Locomotive Cyclopedia reprint "Streamlining Shop Schedules"—RM 5-45.



THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT



30% Lower Threading Costs with Landmatic Heads

Cost figures show that LANDMATIC HEADS — in thousands of plants — on innumerable types of threading operations — are doing a BETTER — LOWER COST job.

The performance of these Heads in threading Valve Seat Rings for an eastern manufacturer is an example of LANDMATIC HEAD economy. Threads ranging from 1½" to 5" in diameter, 14 and 1½ threads per inch, are cut with Landmatic Heat Treated Heads at an average saving of 30% over methods previously used.

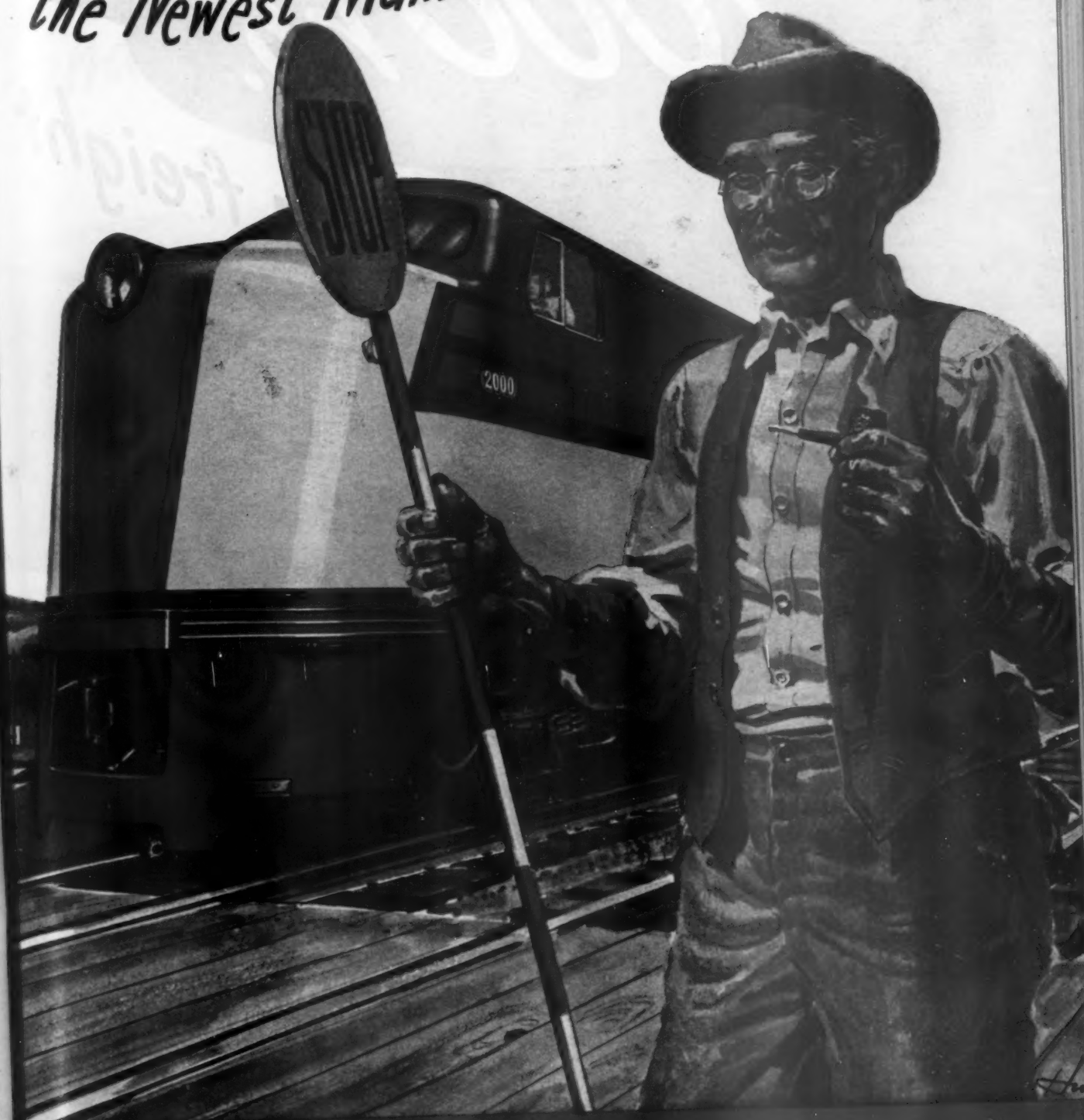
Would you be interested in seeing if substantial economies might likewise be possible in your Turret Lathe operations through use of Landmatic Heads?

Bulletin F-90 will give you detailed information

LANDIS MACHINE COMPANY, WAYNESBORO, PENNA, U.S.A.

THREAD CUTTING MACHINES • DIE HEADS • COLLAPSIBLE TAPS • THREAD GRINDERS

the Newest Mainliner is Going Places!



BALDWIN-
Westinghouse

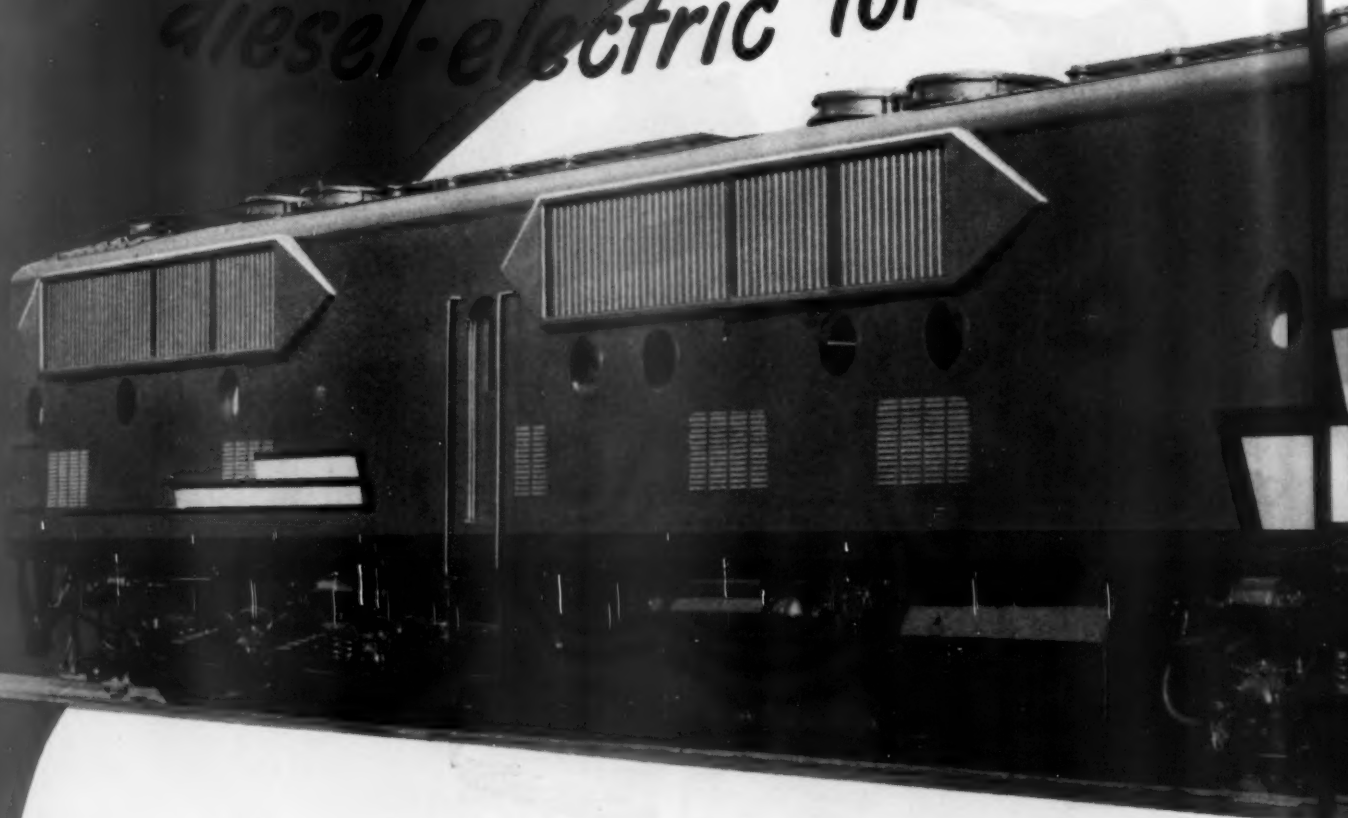
DIESEL-ELECTRIC LOCOMOTIVES



SEE NEXT PAGES

2000 hp.

diesel-electric for freight



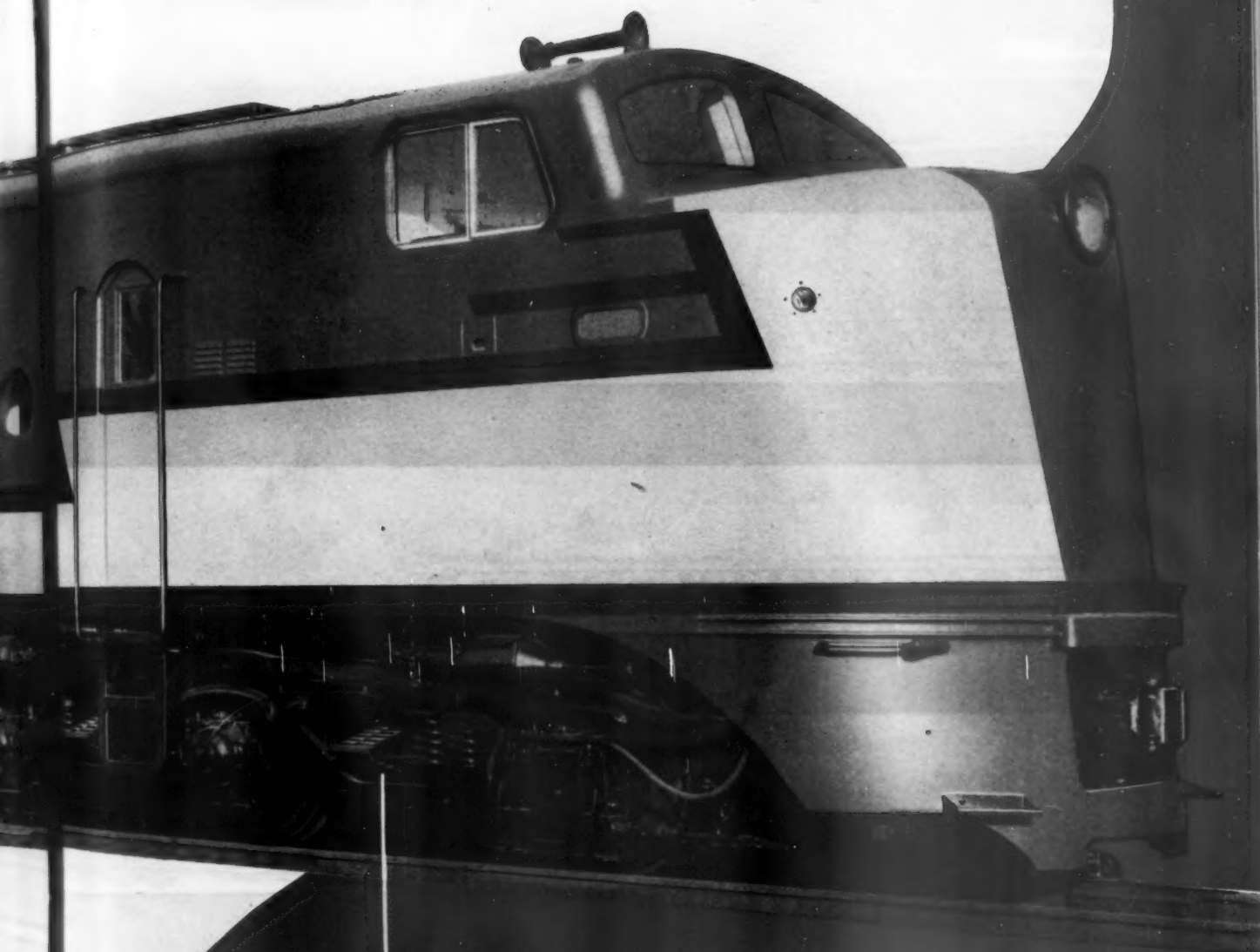
The first Baldwin-Westinghouse diesel-electric locomotive for main line freight and passenger service is already proving its dependability and smoothness of operation.

The motive power comprises two 1000-hp. diesel-generating sets, identical in design with those which are giving satisfaction in hundreds of Baldwin-Westinghouse switching and transfer locomotives, on railroads from coast to coast.

Air throttle control, automatic wheel-slip protective device, and thermostatic temperature control are Baldwin-Westinghouse features which add to the efficiency of the new locomotive.

Baldwin and Westinghouse have cooperated in meeting railroad requirements for fifty years, and they have drawn on this accumulated experience in producing America's latest main line diesel-electric.

and passenger service



THE **BALDWIN-**
LOCOMOTIVE WORKS, PHILADELPHIA



Westinghouse

ELECTRIC & MANUFACTURING CO., EAST PITTSBURGH, PA.

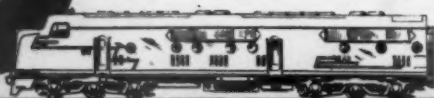
A FLEXIBLE MOTIVE POWER UNIT



2000 hp.

A

Baldwin-Westinghouse 2000-hp. diesel-electric locomotive (A Unit), powered by two 8-cylinder, 4-cycle, 1000-hp. diesel engines.



4000 hp.

A

A



6000 hp.

A

B

A



The A Unit is a self contained locomotive to be used when power requirements do not exceed its rated 1000-hp. capacity.

For heavier service, two A Units can be coupled together, back to back, forming a 4000-hp. locomotive which operates equally well in either direction, without the necessity of turning the locomotive at terminals.

For handling the heaviest freight and passenger trains, on fast schedules, two A Units and one B Unit (without operator's cab) can be coupled together to form a 6000-hp. locomotive for operation in either direction without turning.



THE

BALDWIN-

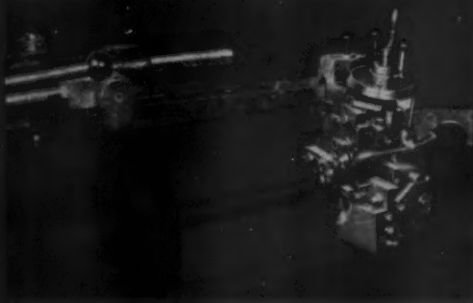
LOCOMOTIVE WORKS, PHILADELPHIA

Westinghouse

ELECTRIC & MANUFACTURING CO., EAST PITTSBURGH, PA.

Taper bolts

ON A
PRODUCTION
BASIS



If you are interested in turning taper bolts faster and more accurately, you will want to know more about the productive possibilities of this combination straight and taper roller turner and our method of machining taper bolts on a production basis.

The rolls and cutter of this roller turner can be adjusted rapidly to turn any diameter from $\frac{3}{4}$ inches to $2\frac{1}{2}$ inches. Conversion from turning straight diameters to turning tapers up to $\frac{1}{4}$ inch per foot can be made instantaneously at any point in the operating cycle.

Write to us for more detailed information and our book "Turret Lathe Earning Power" — your request will receive a prompt reply.

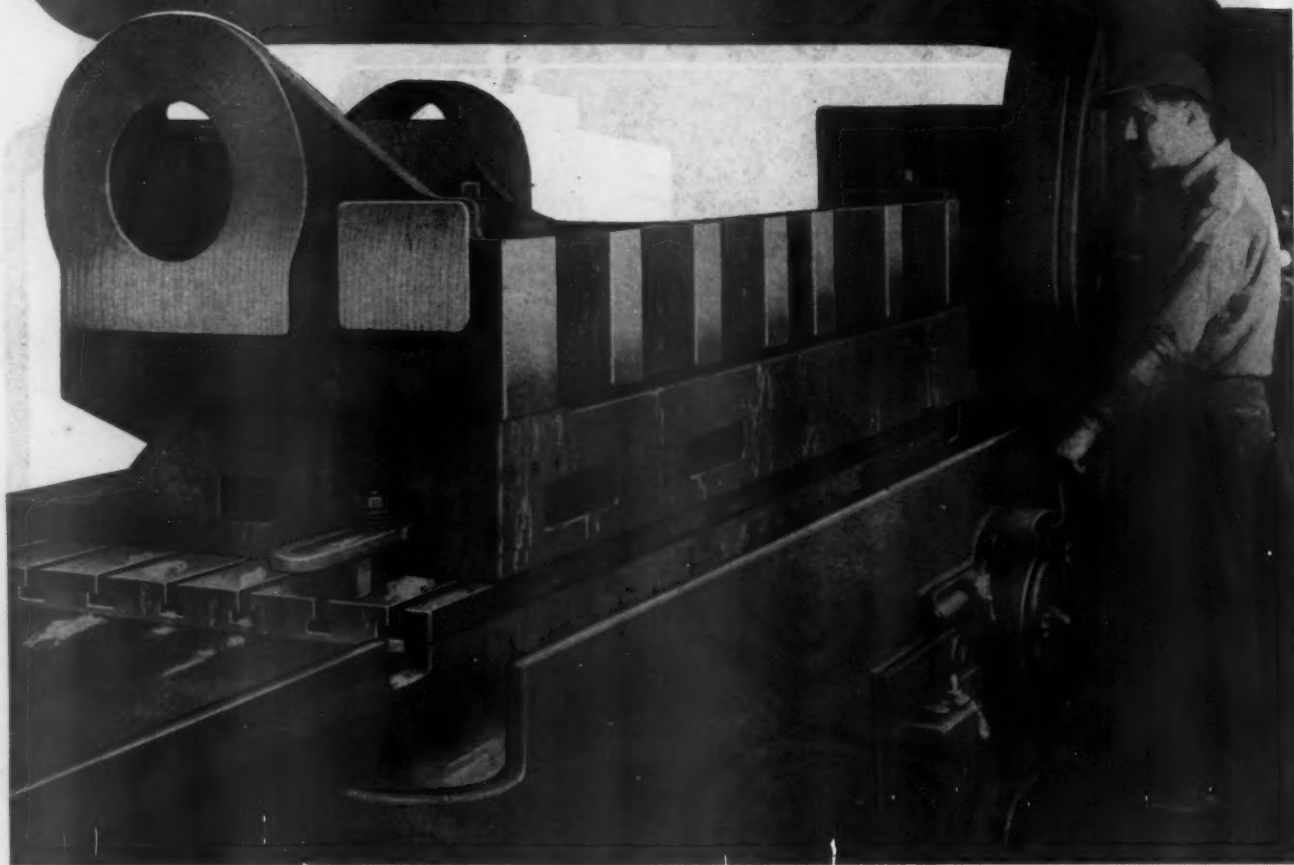


JONES & LAMSON

MACHINE COMPANY
Springfield, Vermont, U.S.A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

HOW TO BEAT YOUR LEAST TIME FOR MACHINING THIS PIECE



Can you spare a couple of minutes to estimate the least time it would require to machine this piece? Areas $84'' \times 9\frac{1}{2}''$ and $21\frac{3}{4}'' \times 29\frac{1}{2}''$. It's a fussy job—the two sides shown must be 90° square with each other and both must be 90° square with the horizontal. What's your answer?

Now look at the time for face grinding the same piece—150 minutes floor-to-floor.

For a job like this, and for many a job you have, face grinding is often the only justifiable method. Write for Bulletin 44-G today and see how to save time and material by face grinding.

MAIL TODAY FOR NEW FOLDER

Diamond Machine Company of Philadelphia
2210 Aramingo Avenue, Philadelphia 25, Pa.
Gentlemen: Please send me promptly your Bulletin 44-G which shows how to speed-up production with the Diamond Face Grinder.

Name _____ Title _____
Company _____
Address _____ State _____
City _____

"THE DIAMOND



THAT CUTS YOUR COSTS"

**DIAMOND
MACHINE COMPANY
OF PHILADELPHIA**

Subsidiary of American Engineering Company, builders of fine machinery for over 75 years, and manufacturers of machine tools, machine parts, and machine accessories.

IN FORGINGS

You get

MAXIMUM METAL

QUALITY

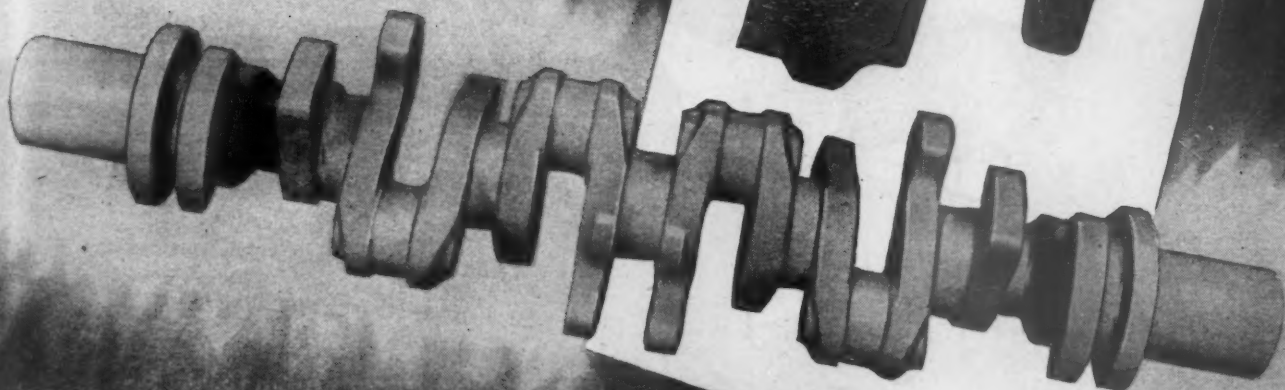


Photo-etch through a longitudinal cross-section of an aircraft engine crankshaft, shows how the fibre-like flow lines have been directionally worked into the part to provide the utmost strength and toughness to meet the stress concentrations exactly as they occur under actual service conditions. Note the degree of grain refinement and density of flow lines which indicates that the penetration of the impact wave in forging has been most intense, exactly where the stress on the crankshaft is highest.



7 ADVANTAGES

Forgings Offer

- 1. High tensile and impact strength obtained through concentration of grain structure and fibre-like flow lines.
- 2. Correctly proportioned combination of physical properties to meet a specific service condition.
- 3. Reduction of dead weight; maximum strength and toughness in lighter sectional thicknesses.
- 4. Less time to machine and finish.
- 5. Forgings facilitate rapid assembly through a welding adaptability of widest range.
- 6. Forgings reduce accidents to men and machines; provide a greater margin of safety.
- 7. Forgings can take it; maximum strength and toughness through a concentration of fibre-like flow line structure at points of greatest shock and stress.

The behavior of a part under complex stresses which must be met in actual service is of utmost importance to the design engineer. The success or failure of a forging application is often determined by the degree of co-operation between design engineers, production executives and forging engineers while the part is still in the design stage. Such co-operation is of the utmost importance in obtaining in forgings, the most suitable combination of physical properties to meet a specific service condition. The design engineer who invites the forging engineer to co-operate, before the design is fixed, will be guided to utilize fully the fibre-like flow line structure of wrought metals to provide for dependable performance and long service life in every type of part and product.

Forgings offer many advantages beyond those called for in the specifications. A re-check of every stressed part, as well as simple handles and levers, against the seven advantages that forgings offer, may reveal the possibility of improving a part or a product; or the opportunity to strengthen a part or to give it longer service life; to lessen weight; to reduce cost of machining and finishing and to speed up assembly. Consult a forging engineer connected with your source of supply about how to utilize to the utmost the metal quality of forgings in the production of your peacetime product. Backed by years of experience, he quickly defines the exact nature of your problem and will guide you in utilizing up-to-date forging techniques to obtain all the advantages that forgings offer.



SYMBOLIC EMBLEM OF THE
DROP FORGING ASSOCIATION



DROP FORGING ASSOCIATION

605 Hanna Building • Cleveland 15, Ohio

- ☐ Booklet on "Metal Quality—How Hot Working Improves the Properties of Metal."
- ☐ "Drop Forging Topics," issued ten times a year

DROP FORGING ASSOCIATION

605 HANNA BUILDING • CLEVELAND, OHIO

Name _____ Position _____
Company _____
Address _____ City _____ State _____



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General Electric Company

NOW TRY for *FASTER*,

A.W.S. CLASSIFICATION E6020/E6030

*Welds made with W-27 electrodes
meet these requirements.*

1. High mechanical properties
2. Rigid X-ray examination
3. Excellent profile appearance
4. Excellent surface appearance
5. High deposition rate

● This new, heavily covered electrode—Type W-27—is specially designed for flat and horizontal fillet welding and flat groove welding at medium to high alternating or direct currents.

Proved by extensive laboratory and field tests, which have been confirmed by shop production data, the W-27 is the most advanced heavily covered electrode available for its particular applications.

Meeting A.W.S. E6020/E6030 requirements, this new electrode's stable, forceful arc produces deep penetration and a heavy slag, which completely covers the deposit, yet is easy to remove. Welds made with W-27 are outstanding in appearance and have ample margin over requirements of A.W.S. specifications.

For applications involving flat or horizontal

fillet welding or flat groove welding, and capable of being fabricated at high currents, this electrode's higher melting rate allows faster welding—increases production.

Where heat input is a critical factor, the W-27's higher melting rate allows satisfactory welding speeds at less than normal current input. The work, therefore, shows less warpage and less crack sensitivity, and there is a marked reduction in locked-up stresses in deposited weld metal.

Since only its use in actual production will prove the value of any electrode, why not ask your G-E arc-welding distributor for samples of the W-27 and let your own operators be the judges. Your distributor can also provide you with more detailed performance data. Or, write to General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

673-560-8748

OUR NEW W-27 ELECTRODE

BETTER FLAT AND HORIZONTAL WELDING



For horizontal fillets, the W-27's metal and slag set up evenly on the vertical plate, assuring welds having equal legs.



Because of its exceptionally high melting rate, plus its ability to handle high currents, the Type W-27 permits faster welding—increases production.



**ARC WELDING
ELECTRODES
and
EQUIPMENT**

RANGE OF MECHANICAL PROPERTIES

	As Welded	Stress Relieved
Tensile strength, lb per sq in...	63,000-68,000	61,000-65,000
Yield strength, lb per sq in....	53,000-57,000	47,000-52,000
Per cent elong. 2 in.....	27.0-32.0	32.0-38.0
Per cent reduction of area.....	54.0-62.0	60.0-66.0
Impact resistance ft-lb izod.....	50-70	
Endurance limit, lb per sq in.....	30,000-34,000	
Density, grams per cu cm.....	7.83-7.86	
Brinell hardness.....	150-170	

Buy all the BONDS you can
— and keep all you buy



THE HUFFORD Pneumatic Jaw provides a rock-solid yet readily releasable grip on extrusions, rolled stock, tubing and narrow sheet during stretching, straightening or forming operations. It entirely eliminates the troublesome problems encountered with manually operated tapered grippers when heavy tension is applied to the work because it is air operated for both opening and closing and will not "freeze"!

Comprising essentially a double-acting air cylinder, with integral selector valve, tapered housing and hardened steel inserts, the Hufford Jaw operates off the regular plant air supply. Installation requires only connection of an air hose to the unit, which in turn is

installed in place of the ordinary tapered grippers.

HARDENED STEEL INSERTS

Any Shape workpiece that fits within a 4", 6" or 8" diameter circle can be accommodated in the three Hufford Jaw sizes, and the inserts are quickly and easily interchangeable in the same size housing without removing the unit from

the machine on which it is used. Capacities are ample for the toughest jobs ... ranging from 20 to 75 tons!

The Hufford Pneumatic Jaw is ideal for use on all types of stretch-forming, straightening and bending machines, and—in fact—wherever a positive, uniform grip is required. Send us a description of your material gripping requirements for prompt recommendation ... and ask for Engineering Bulletin M-1, giving further details!

HUFFORD JAW CAPACITIES

Graphically presented below are the tremendous capacities of the various Hufford Jaw sizes ... ample to meet the toughest gripping problems. Jaws and inserts can be made to special requirements, if desired.

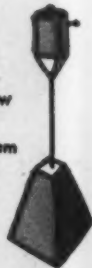
AD-5
Pneumatic Jaw
40,000
pounds =
weight of steel
box car



AD-8
Pneumatic Jaw
100,000
pounds =
weight of 2
tank cars

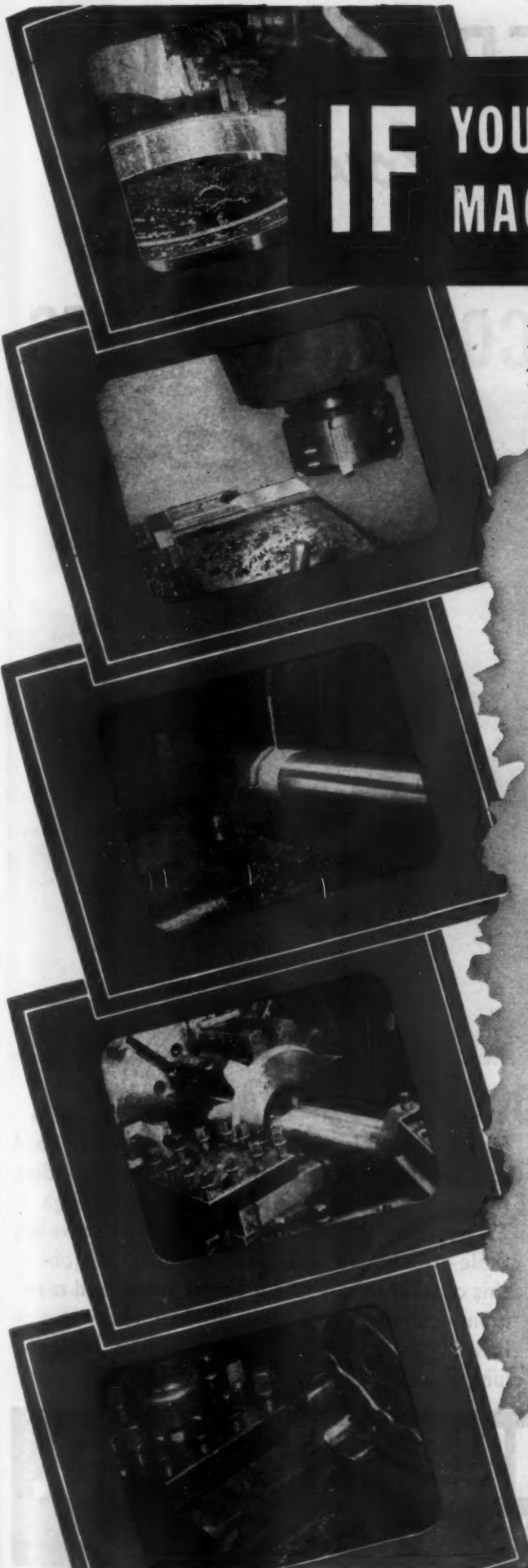


AD-9
Pneumatic Jaw
150,000
pounds =
weight of steam
locomotive



HUFFORD MACHINE WORKS, INC.

207 NORTH BROADWAY, REDONDO BEACH, CALIFORNIA



IF YOUR BUSINESS IS MACHINING STEEL

An important phase of the "business" of all railway mechanical departments is machining steel parts for power and rolling stock. That is why the experience of America's shell-makers is significant . . .

SHELL-MAKERS USING KENNAMETAL GET UP TO 6 TIMES THE OUTPUT PER UNIT OF CEMENTED CARBIDE CONSUMED

Recent official reports regarding the national consumption of cemented carbides on tools used for machining 105 mm shells disclose the following significant facts:

Where carbides other than Kennametal are used, the average consumption per shell produced has been about 3 calculated grams.

Four large manufacturers who use Kennametal for 50% to 100% of their tools, consume on the average, only $\frac{3}{4}$ of a gram of carbide per shell.

Three plants using Kennametal exclusively, average less than $\frac{1}{2}$ gram per shell.

In the current huge shell-producing program Kennametal is being used successfully on all the large sizes for roughing, finishing, facing, cutting off, grooving, and chamfering, as well as for de-burring of band grooves with a distinctive lathe file.



The properties of Kennametal that produce such notable results for shell makers are equally valuable to any company in the business of machining steel. Even the toughest alloys, and those having a hardness up to 550 Brinell, can be readily machined at economy-promoting speeds, and with unusually long tool life.

The effective constituent of steel-cutting Kennametal is tungsten-titanium-carbide ($WTiC_2$), which distinguishes it from all other cemented carbides, and is a major reason for its outstanding success.

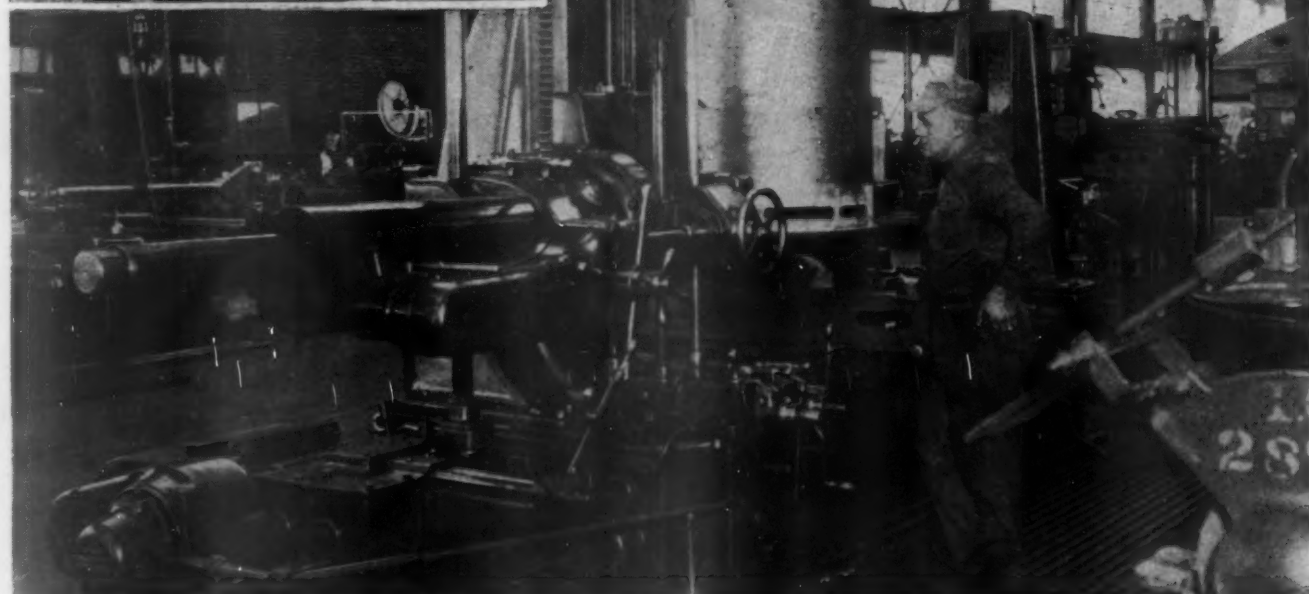
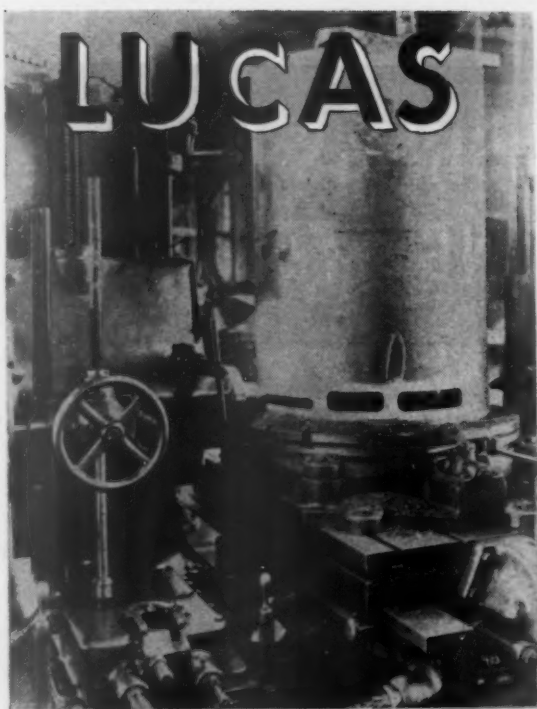
Kennametal field engineers are fully experienced in the application of cemented carbide tools. They will be glad to help you on any steel machining problem.



KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc. LATROBE, PA.



LUCAS

VERSATILITY

Covers

WIDE RANGE OF LOCOMOTIVE PARTS

HIGHER STANDARDS OF LOCOMOTIVE MAINTENANCE

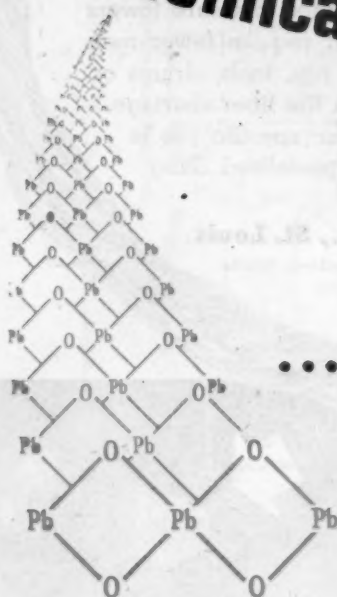
THE broad scope of machine operations and combinations of operations which the Lucas Horizontal Boring, Milling and Drilling Machine can handle at a single set-up, gives this time- and labor-saving tool a prominent place in the modern railroad shop. Milling the ports in a cylinder bushing is a typical example. Note the simplicity of the Lucas set-up for this job. There are no complicated jigs or fixtures required. The bushing is merely clamped to the revolving table.

Simple controls, rapid power movements and quick return in all directions are the outstanding features which have effected savings as high as 75 per cent on this job. A circular swiveling table attachment is recommended for all jobs of this character to insure greatest speed and maximum economies. In addition the Lucas not only insures greater accuracy but also better and longer wearing machined surfaces.

LUCAS MACHINE TOOL CO.

CLEVELAND, OHIO

Uniformity of Chemical Composition



... another real reason why **RED LEAD** means Extra Protection against Rust

Red Lead's outstanding uniformity of performance results not only from its extreme purity but also from its precise chemical composition... lead orthophosphate. This makes for predictable chemical behavior.

For many years Red Lead has been the standard among metal protective paints because of inherent fundamental properties of the pigment itself.

Among the most important of these is Red Lead's definite chemical composition and uniformity—as distinguished from pigments which have indefinite composition or vary from batch to batch, with resulting possibility of variation in performance.

One reason for this uniformity is that Red Lead is a simple chemical compound, being made from oxygen and high purity metallic lead. Consequently, Red Lead is an extremely pure compound. It contains no corrosion accelerating impurities such as water-soluble salts of chlorides or sulfates.

Uniform composition means dependable performance, day after day, job after job.

Furthermore, Red Lead has the property of counteracting acid conditions, recognized as accelerators of rust. In the presence of various acids, Red Lead forms

insoluble neutral lead salts at the approximate rate at which the acids are supplied. This is true whether the acids originate from acid forming environments, such as gas, smoke and moisture in the atmosphere, or from the decomposition of the vehicle. Thus, a rust inhibiting condition is maintained with a Red Lead paint.

Remember, too, that Red Lead is compatible with practically all vehicles commonly used in metal protective paints, including phenolic and alkyd resin types.

Specify **RED LEAD** for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better paint for surface protection of metal, if it contains Red Lead.

Write for New Booklet

"Red Lead in Corrosion Resistant Paints" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas. If you haven't received your copy, address nearest branch listed below.

* * *

The benefit of our extensive experience with metal protective paints for both underwater and atmospheric use is available through our technical staff.



NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.)

DUTCH BOY RED LEAD

**THESE SLINGS PASS
WARTIME
INSPECTION
FOR SAFETY...SPEED...ECONOMY
OF MANPOWER AND MATERIALS**

When virtually every load is tagged for war production, efficient handling becomes an obligation—one you'll discharge on all counts with Yellow Strand Braided Wire Rope Slings.* *Safety?* The strength of this patented sling lies in tough Yellow Strand Wire Rope, so braided that it gains marked flexibility... conforms readily to any product... grips it gently but securely. *Speed?* Light weight and high kink-resistance make the sling easy to carry, attach and remove. *Economy?* A compact braided sling conserves manpower and materials, compared with bulky types. Even when lifting heavy locomotives, turbines, pressure towers or weapons, a Yellow Strand Braided Sling will require fewer men—and less steel. And for such lighter lifts as jigs, tools, drums or crates, a Yellow Strand Sling offers relief from the fiber shortage. Fitting material-handling equipment to your specific job is the function of Broderick & Bascom's specialized Sling Engineers. Investigate today!

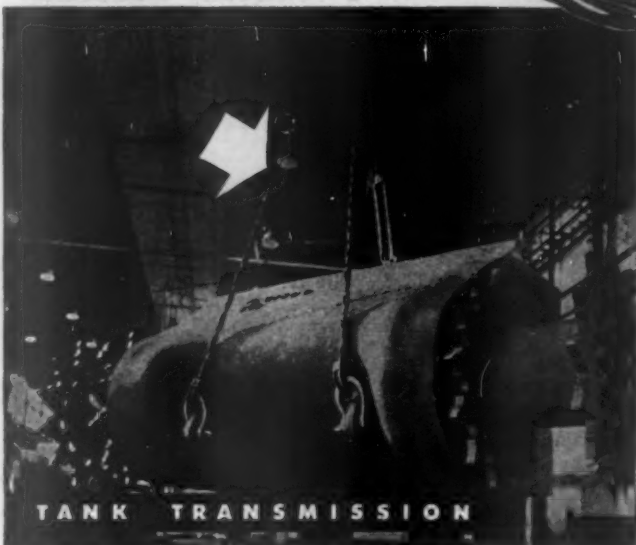
Broderick & Bascom Rope Co., St. Louis

Branches: New York, Chicago, Houston, Portland, Seattle
Factories: St. Louis, Seattle, Peoria

FREE

Riggers' Hand Book

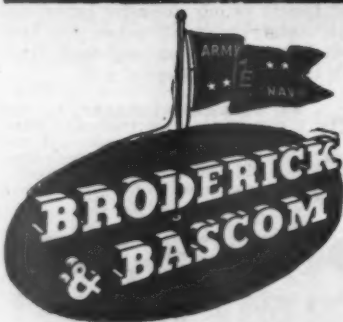
96-pages of practical wire rope sling information. Send for free copy.



TANK TRANSMISSION



DIESEL LOCOMOTIVE



*Patents: U. S., 1475859, 1524671, 2142641, 2142642, 2299568. * Canadian, 252874, 258088

YELLOW STRAND
Braided Wire Rope SAFETY SLINGS

TREAT 'EM RIGHT



Keep Your Carbide Tools in the Fight

CONSERVE THE TOOLS YOU HAVE

If you follow a few simple rules now, you can avoid a critical tool situation in your plant. Handle all your present carbide tools with "kid gloves"—treat 'em right—and they will give better service, do all that is asked of them, and enable you to meet your greatly increased production schedules.

For practical information on how best to conserve your carbide tools and save delays, get in touch with Firth-Sterling.

Firth-Sterling

STEEL COMPANY

FIRTHITE

3 RULES

THAT CONSERVE TOOLS

HANDLE 'EM WITH CARE

Carelessness may damage cutting edges.



KEEP 'EM SHARP

Re-sharpen in time!
A dull edge slows production.

GRIND 'EM PROPERLY

Find out the right way—and do it.

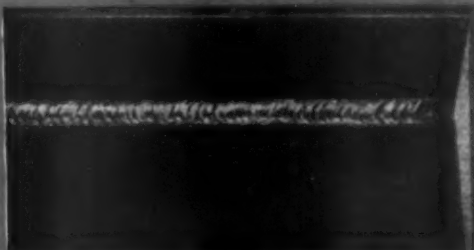


SAYS THE MAN IN THE HELMET—

“For flat, smooth fillets on vertical and overhead welds, you can't beat AIRCO No. 230 Electrode

AWS Classification E 6011

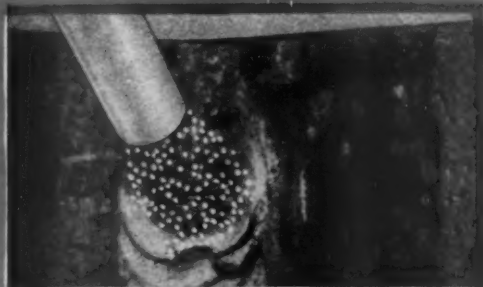
” . . . It's tops in the field for all-position AC welding.



“I like the neat, smooth fillets it gives on vertical and overhead welding. They're unusually strong, deep welds, too — good enough to meet the strictest code requirements.



“The metal sets up rapidly, which is one of the reasons why this Airco No. 230 is an especially fine electrode for making vertical and overhead welds.



“Slag doesn't interfere and the fine spraying action and lack of arc-blow help out greatly, too.

“I use it on AC or DC. It's mainly a grand all-position AC electrode, but it works fine with DC reverse polarity, too. It's easy to identify by this A.W.S. color marking — white end and blue band. Conforms to A.W.S. Classification E6011.”

Airco electrodes are made in a complete range of types and sizes for every welding job. The new catalog describes Airco's complete line.

For a free copy of Airco's News Electrode Catalogue No. 120 write to the local Airco office or to Dept. RME, Address Air Reduction, General Offices: 60 East 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, General Offices: Houston 1, Texas.



Weld with



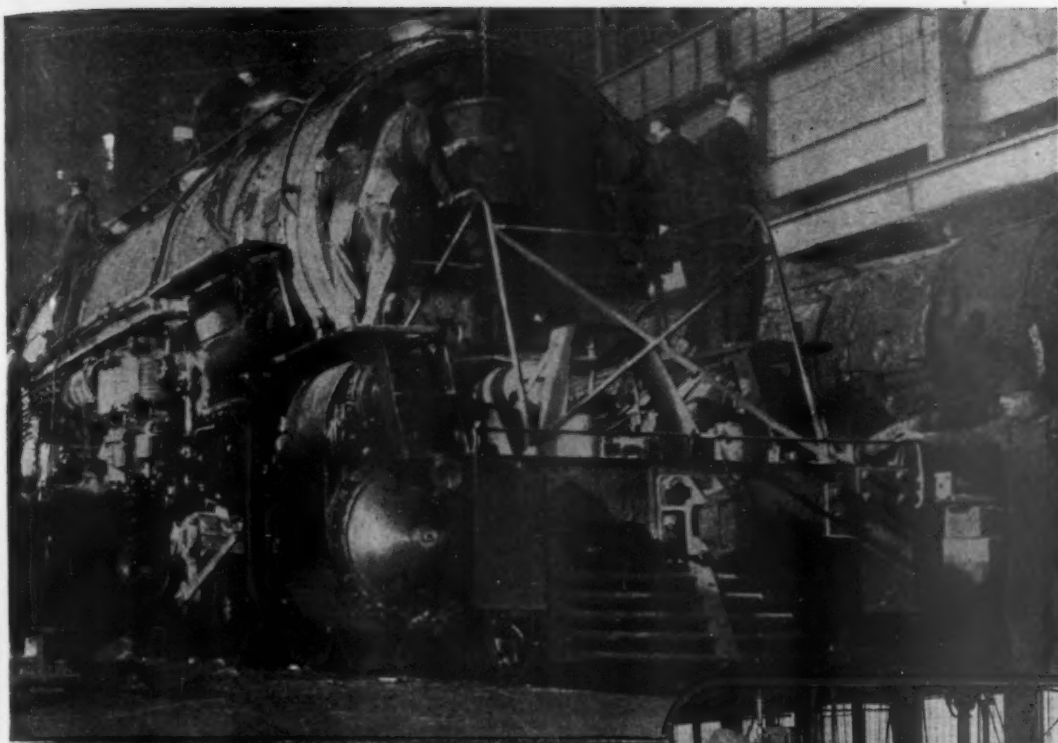
AIR REDUCTION

Offices in All Principal Cities

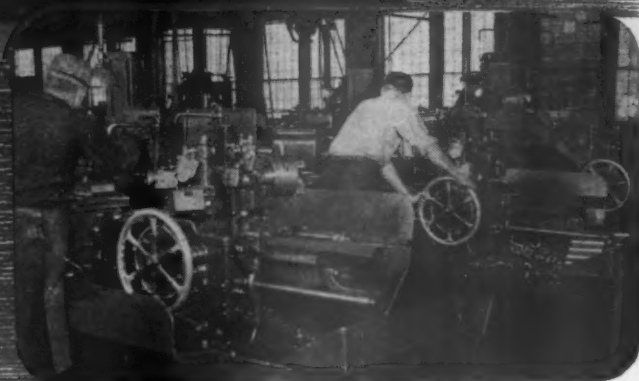


ELECTRODES

FOR BETTER WELDS AND EASIER WELDING



**Locomotive overhauls
demand new parts
in all shapes
and sizes**



RAILROAD machine shops get plenty of chance to show their versatility and ingenuity. They are called upon to make, and speed delivery of precision parts in all varieties of shapes and sizes.

Among parts needed often are the countless pieces that can be produced on turret lathes. It is then that the rigidity, power, precision, and quick adaptability of a Warner & Swasey Turret Lathe really pays off. Just about every forming cut, boring, drilling and threading operation needed to produce precision parts in fast time can be performed on a Warner & Swasey using a universal tooling setup specifically

planned to handle most railroad turning jobs.

These standard tooling setups for bar and chucking work developed by Warner & Swasey not only save turning time on individual pieces, but enable the turret lathes to be diverted from one job to another without time lost in changing tools.



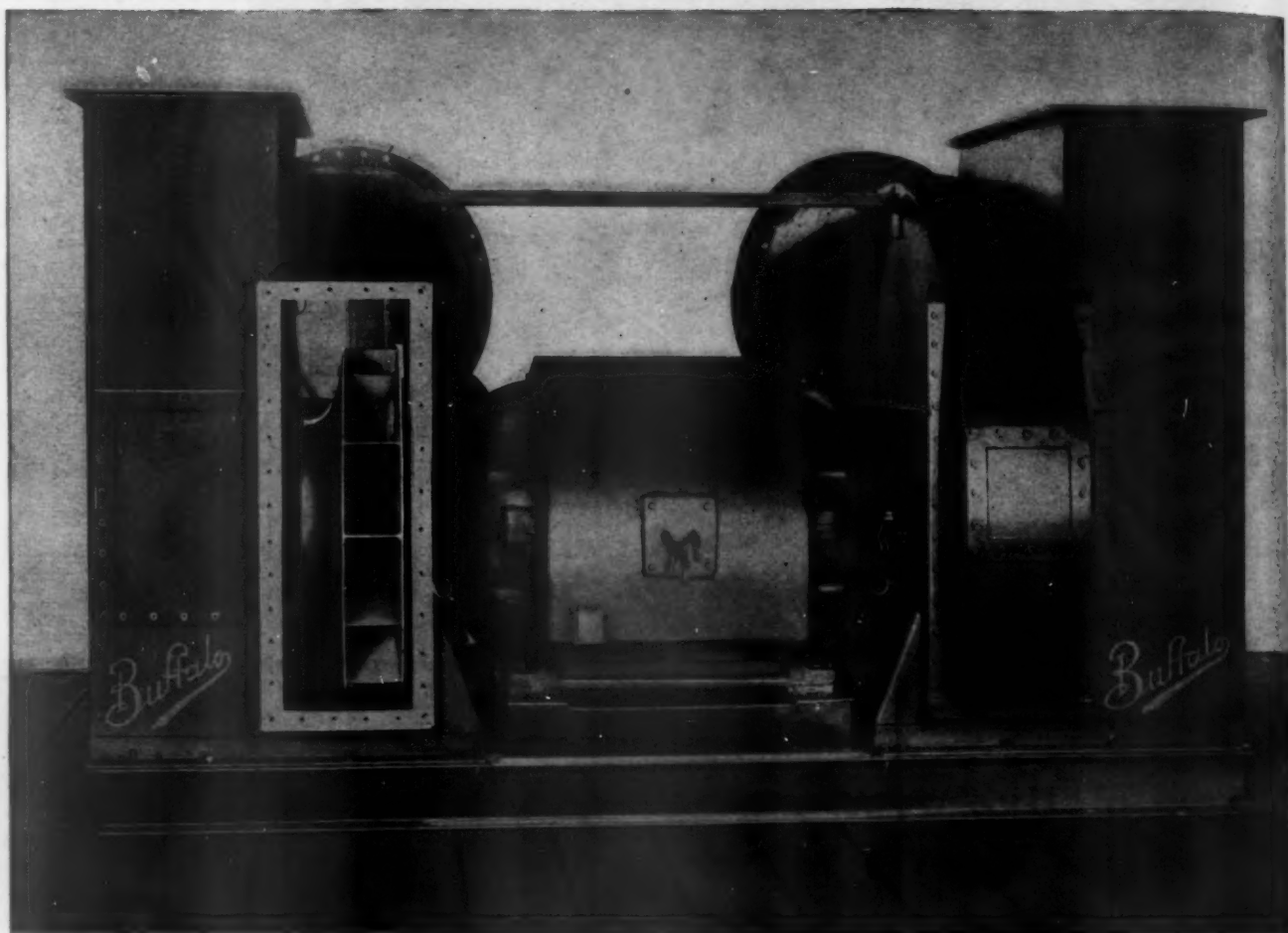
Send for special railroad shop bulletin describing Warner & Swasey turret lathes and standard tooling setups specifically designed for railroad service.



YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY



TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES



Experience "pays off" ~

Better engineering is always expensive. It costs more in salaries, more in overhead, requires more expensive equipment. In the long run, however, because the customer benefits, it is a good investment.

The fan pictured above, for example. Two units were required — one to deliver 88,000 cfm at 51" static pressure — the other to deliver 44,000 cfm at 120" static pressure. There is no volume market for such fans — nor any stock design which would give the desired results. "Buffalo" engineers, from accumulated experience, were able to design the practical heavy-duty unit shown above with minimum lost time and very satisfactory efficiency. One unit consists of two fans operating in series, delivering 44,000 cfm at 102" static pressure; the other unit consists of twin fans operating in parallel; — 88,000 cfm at 51" static pressure.

When you purchase fan equipment, be sure to get the benefits of Buffalo engineering. Sales representatives in all principal cities will be glad to make recommendations.

BUFFALO FORCE COMPANY

174 Mortimer Street Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



fans for industry



Check these Main Points

WHEN YOU'RE MACHINING STAINLESS STEEL

Have you a copy of the

Allegheny Ludlum

"Fabrication Blue Sheet"?

Contains a wealth of reliable, certified data, not only on the machining of Allegheny Metal, but on the best methods employed in other fabrication operations on stainless steel—forming, welding, finishing, etc. Write for your copy—you'll find it highly useful and complete.

ADDRESS: DEPT. RME-33

COME war or peace, stainless will always be a critical material *in the shop*. You'll want to keep rejects and spoilage low, as well as machining time and cost—and there are ways to do it.

Cutting speeds can't be as fast as with carbon steel or low alloys. Tools should be high speed steel or carbide-metal tipped, with a generous rake and a chip breaker, if possible. Keep them sharp, and don't allow the tool to ride on the work, to avoid work-hardening.

More important, check the design of the cutting tool itself, and check the possibility of using one of the special easy-machining grades

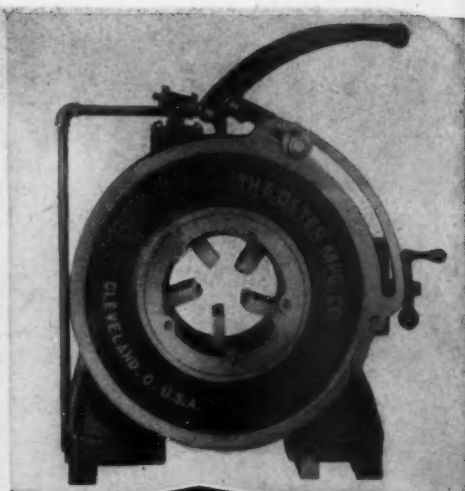
of Allegheny Metal. Let us help you also to select the right cutting tool from our complete range of High Speed Steels, ALX Cast Alloy Bits and Carmet Carbide Tools.



Allegheny Ludlum
STEEL CORPORATION

GENERAL OFFICES: BRACKENRIDGE, PENNA.

W&D ... D-9294 Branch Offices in Principal Cities ... Allegheny Metal also handled by all Joseph T. Ryerson & Sons, Inc. Warehouses



OSTER

"WILCO"

The Dual Purpose Threading Machine

OSTER "WILCO" PIPE THREADING SPEEDS!

No. 704 "WILCO"

Pipe Size	Threading Time
1"	16 seconds
1 1/4"	16 seconds
1 1/2"	24 seconds
2"	25 seconds
2 1/2"	38 seconds
3"	40 seconds
3 1/2"	56 seconds
4"	58 seconds

No. 706 "WILCO"

Pipe Size	Threading Time
1 1/2"	19 seconds
2"	20 seconds
2 1/2"	30 seconds
3"	31 seconds
3 1/2"	48 seconds
4"	49 seconds
5"	70 seconds
6"	74 seconds

Note: Above time studies based on cutting full American National Standard pipe threads at recommended speeds.

Easy operation and threading speeds of Oster "WILCO" pipe machines recommend them for either production or maintenance threading. In many shops they serve the dual purpose.

The "WILCO" die-head and one set of holders and chasers thread the standard range of each machine. A simple adjustment of the cam lever sets chasers to any size of pipe. The lever is equipped with a micrometer adjustment for extreme accuracy in setting chasers for any depth thread desired.

Regular equipment furnished with each machine includes one complete set of right hand, *high speed steel* pipe chasers with holders, threading all sizes within regular range; cut-off device with three centering guides; *high speed steel* cut-off tool; *high speed steel* reaming and chamfering forming tool; oil pump and reservoir; three-jaw, gripping chuck on front of spindle; four-jaw centering chuck on rear of spindle; motor of required standard specifications and non-reversing, magnetic controls.

Two "WILCO" Models

No. 704. Standard range 1" to 4" pipe. Extra range 1/2" to 3/4" pipe. Bolt range 3/4" to 3".

No. 706. Standard range 1" to 6" pipe. Bolt range 1" to 4".

There's an Oster Distributor near you. If you don't know his location, write us for complete details.

THE OSTER MANUFACTURING COMPANY, 2030 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.



USES FOR NO-OX-ID RUST PREVENTIVE

on new cars and in your normal repair program

All types of railway cars benefit under the NO-OX-ID rust preventive program—new cars and cars going through shop for scheduled repair program. NO-OX-ID offers complete protection against rust ... a perfect seal against moisture and corrosion.

Especially recommended for use in railway car protection is NO-OX-ID Filler Red "C" for application between riveted metal-to-metal or abutted joints, or wood-to-metal bolted joints. Coating both pieces of metal or both wood and metal with an evenly applied film of NO-OX-ID prevents rust at the contact points.

On double-sheathed box cars, a coat of NO-OX-ID sprayed on the inside surface of outer steel side sheets and ends, behind the wood lining, provides a perfect rust barrier. NO-OX-ID also affords superior protection to all-steel, open-top coal cars, safeguarding inside surfaces from corrosion accelerated by live coal. It also serves as a rust preventive for car journals in storage. Write for NO-OX-ID specifications for railway equipment. Consult us on all of your corrosion problems.



The **ORIGINAL** RUST PREVENTIVE

Dearborn Chemical Company
Dept. RM, 310 S. Michigan Ave., Chicago 4, Ill.
New York • Los Angeles • Toronto



BORING



THE AMERICAN TOOL WORKS CO.

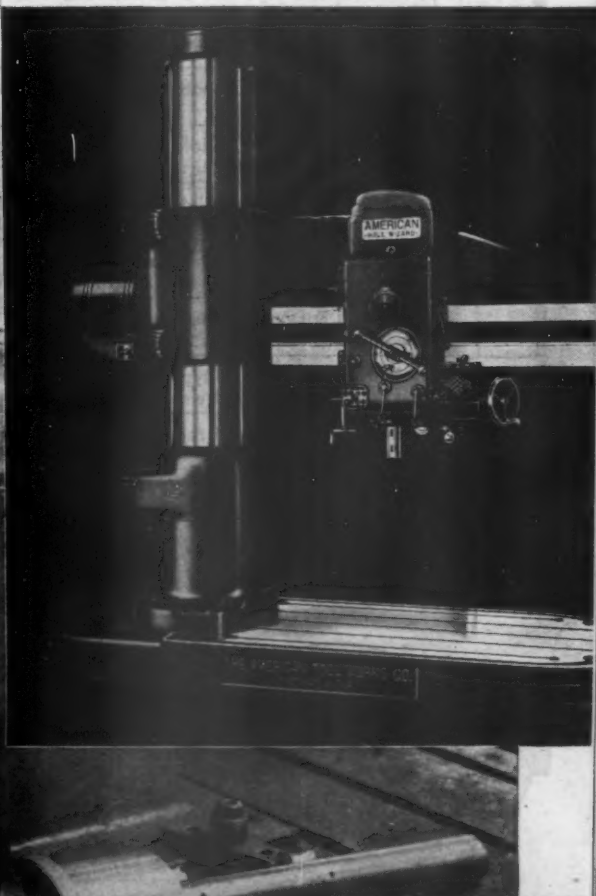
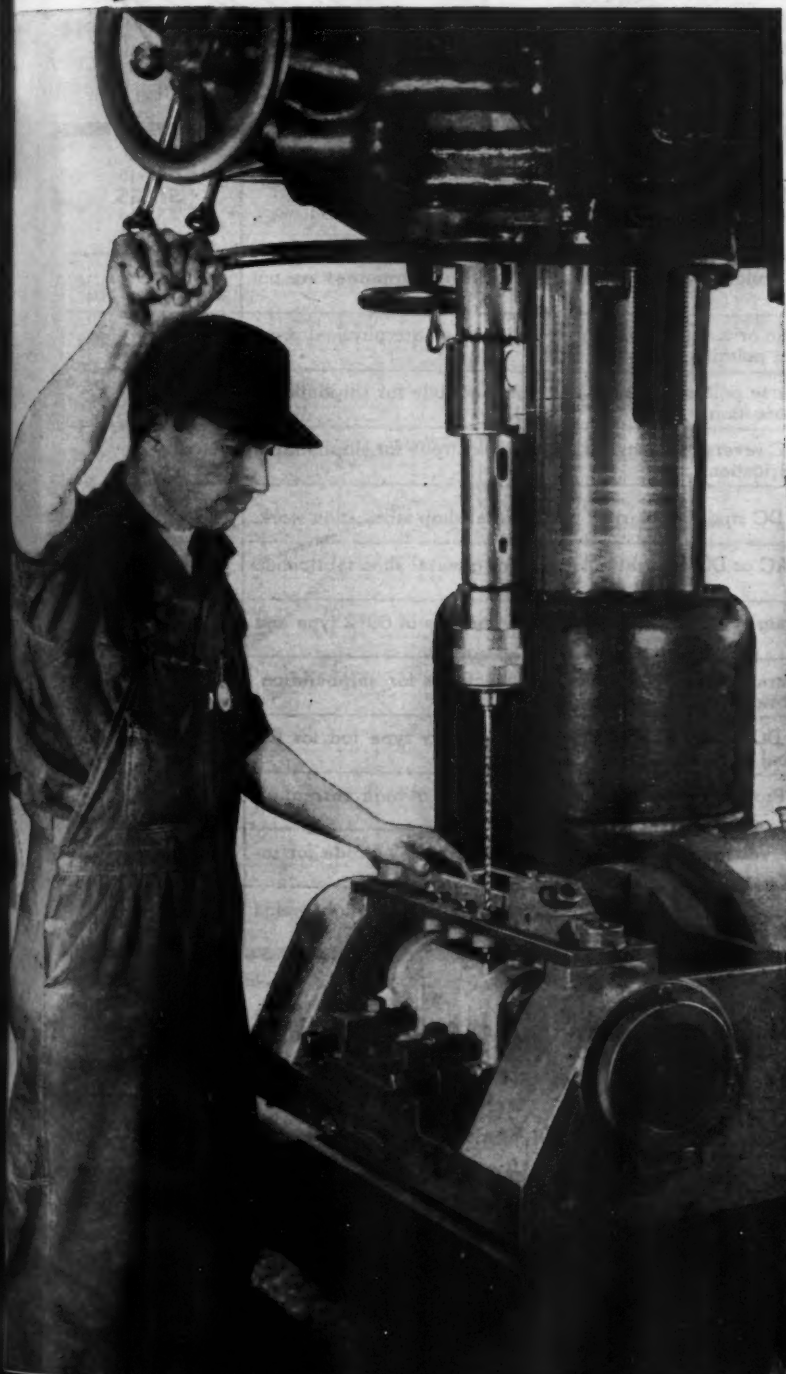
TECHNIQUE...

"American" Hole Wizard Radials are excellent boring machines.

These illustrations show the "American" Hole Wizard Radial boring 40 mm anti-aircraft gun worm housings through a two station jig mounted on an indexing trunnion stand.

The use of indexing trunnion stands brings the work to a comfortable working height for the operator which seldom is the case when stationary, base mounted jigs are employed, thus conserving the operator's energy and prolonging his efficiency.

For additional advantages offered by the combination of "American" Hole Wizard Radials and indexing trunnion stands, write for Bulletin No. 458.



Lathes and Radial Drills Cincinnati, Ohio U.S.A.

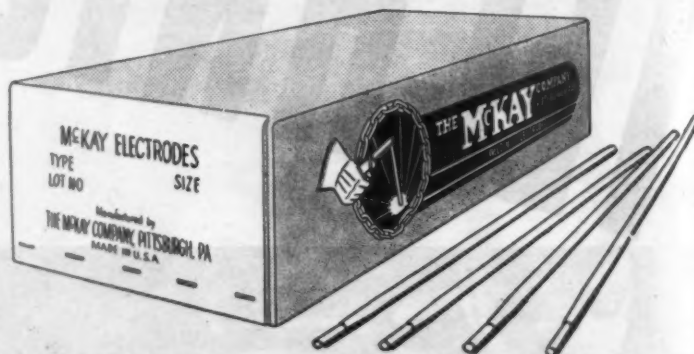
McKAY

Mild Steel

ELECTRODES

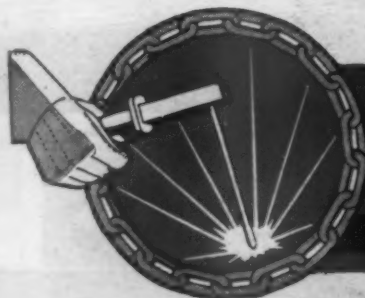
The McKay slogan, "every electrode a leader," is based on the determination to make every grade as good as painstaking research, careful manufacturing and unusually thorough step-by-step testing can make it. In addition to our own laboratories, an active fellowship in Mellon Institute fully qualifies McKay Electrodes to be called the *researched line*.

The standard line includes an exceptionally wide range of mild steel, alloy steel and stainless steel rods suited to almost every welding need but special analyses can be made upon request.



McKAY GRADE	A. W. S. TYPE No.	USE AND CHARACTERISTICS	SIZES
No. 21	4510	Sulcoated for automatic or manual welding where shielded arc physical properties are not required. DC straight polarity only.	3/32"—1/8" —5/32" 3/16"—7/32"—1/4"
No. 3	4520	Flux drawn for high speed automatic or manual welding where shielded arc physical properties are not required. DC straight polarity only.	3/32"—1/8" —5/32" 3/16"
No. 15	6010	All position shielded arc. DC reverse polarity only. Navy type electrode for shipbuilding and pipe line or structural steel fabrication.	3/32"—1/8" —5/32" 3/16"—7/32"—1/4" 5/16"
No. 11	6011	All position shielded arc. AC or DC reverse polarity. Navy type electrode for shipbuilding and pipe line or structural steel fabrication.	1/8" —5/32"—3/16" 1/4"
No. 17	6012	All position poor fit up and fillets. DC straight polarity. For general shop fabrication work.	1/16"—5/64"—3/32" 1/8" —5/32"—3/16" 7/32"—1/4" —5/16"
No. 116	6012	All position poor fit up and fillets. AC or DC straight polarity. For general shop fabrication work.	1/16"—5/64"—3/32" 1/8" —5/32"—3/16" 7/32"—1/4" —5/16"
No. 14	6013	Horizontal fillets and butts. DC straight or AC. Has fillet characteristics of 6012 type and speed of 6020 type.	1/16"—5/64"—3/32" 1/8" —5/32"—3/16" 7/32"—1/4" —5/16"
No. 16	6020	Horizontal fillets and butts. DC straight or AC. Navy type electrode for shipbuilding, pressure vessel and heavy shop fabrication.	3/16"—7/32"—1/4" 5/16"
No. 18	6030	Butt welds and positioned fillets. DC straight or reverse or AC. Navy type rod for flat position work requiring high physical properties.	3/16"—7/32"—1/4" 5/16"
No. 16H	Not Classified	For cover pass work on flat butts. Provides sufficient slag to permit use of high current on cover passes. DC straight or AC.	1/4" —5/16"
No. 117	Not Classified	A non stick type Electrode for low Voltage AC equipment. A fool proof electrode for inexperienced welders.	3/32"—1/8" —5/32" 3/16"—7/32"—1/4"
No. 19	Not Classified	For cast iron repair work. DC straight, reverse or AC. Recommended for water-tight welds on cylinder blocks, motor heads, etc.	3/32"—1/8" —5/32"

McKay electrodes in the A.W.S. 60,000—70,000—80,000—90,000 and 100,000 series are available upon request.



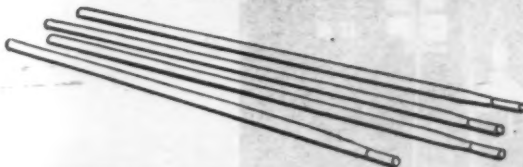
GENERAL SALES OFFICES: YORK, PA.

THE McKAY COMPANY
PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS

McKAY Stainless Steel

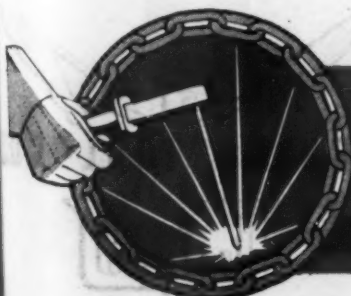
ELECTRODES



McKAY GRADE	A.I.S.I. TYPE No.	USE AND CHARACTERISTICS	SIZES
18-8	308	For welding Stainless Steels from 17 Chrome, 7 Nickel to 20 Chrome, 10 Nickel. Weld metal will be equal or superior to parent metal in corrosion and physical properties.*	1/16" - 5/64" - 3/32" 1/8" - 5/32" - 3/16" 1/4"
25-12	309	For welding type No. 309 Stainless Steel and stain clad plate where higher Chrome Nickel content is desired than can be secured with 18-8 Electrodes.*	1/16" - 5/64" - 3/32" 1/8" - 5/32" - 3/16" 1/4"
25-12 Cb	309 Cb	For welding type 309 Cb Stainless Steel and for multiple pass weld where interpass temperature may be up long enough for carbides to form.*	1/16" - 5/64" - 3/32" 1/8" - 5/32" - 3/16" 1/4"
25-20	310	For welding type 310 Stainless Steel. Also widely used for welding plain Carbon Steel up to .50 Carbon and low Chrome Steels where post heat treatment is not practical.*	1/16" - 5/64" - 3/32" 1/8" - 5/32" - 3/16" 1/4"
18-8 Mo	316	For welding type 316 Stainless Steels. Molybdenum content of weld deposit 2 to 3%.	1/16" - 5/64" - 3/32" 1/8" - 5/32" - 3/16" 1/4"
18-8 Mo	317	For welding type 316 or 317 Stainless Steels. Molybdenum content of weld deposit 3 to 4%.	1/16" - 5/64" - 3/32" 1/8" - 5/32" - 3/16" 1/4"
15-35	330	For use on type 330 Stainless Steels where welds are subject to extremely corrosive agents or require heat resistance up to 2100°F.*	3/32" - 1/8" - 5/32" 3/16"
18-8 Cb	347	For welding type 347 and 321 Stainless Steels where welds may be exposed to service temperatures between 900°-1500°F.*	1/16" - 5/64" - 3/32" 1/8" - 5/32" - 3/16" 1/4"
12 Cr	410	For welding type 410 Chromium Steels. Weld structure is martensitic requiring preheat and post heat treatment to refine grain structure.*	3/32" - 1/8" - 5/32" 3/16"
16 Cr	430	For welding type 430 Chromium Steels. Weld structure is normally ferritic. Preheat and post heat treatment required to eliminate stresses.*	3/32" - 1/8" - 5/32" 3/16"
18 Cr	442	For welding type 442 Chromium Steels. Weld structure is ferritic and subject to grain growth. Preheat and post heat treatment required to eliminate stresses.*	3/32" - 1/8" - 5/32" 3/16"
28 Cr	446	For welding type 446 Chromium Steels. Weld structure is ferritic and subject to grain growth. Preheat and post heat treatment required to eliminate stresses.*	3/32" - 1/8" - 5/32" 3/16"
5Cr Mo	502	For welding type 501 and 502 Chromium Steels. Weld structure is martensitic requiring preheat and post heat treatment, to refine grain structure.	3/32" - 1/8" - 5/32" 3/16"
15-60	....	For welding Nichrome Steel and similar compositions requiring toughness, resistance to oxidation, nitriding and carburization.	1/8" - 5/32" - 3/16"
Tool and Die	....	Weld deposit of work hardening type. Used for building up wearing surfaces subject to impact.	1/8" - 5/32" - 3/16" 1/4"
Tool and Die	....	For repair and build up of air hardening tools and dies. Has good abrasion resistance properties.	3/32" - 1/8" - 5/32" 3/16"
Armorloy A-8	....	For welding Armor Plate and other difficult weldable alloys. Has high resistance to weld cracks when used with dissimilar alloys.	3/32" - 1/8" - 5/32" 3/16" - 1/4" - 5/16" 3/8"

*These Electrodes are supplied with Titania coating for DC reverse polarity unless otherwise specified. They are available in Lime coating for DC or AC and in a special Titania coating for AC on request.

The Titania coating for DC reverse is green in color. The Lime coating for DC or AC is grey in color. The Titania coating for AC is cream in color.



GENERAL SALES OFFICES: YORK, PA.

THE McKAY COMPANY
PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS



L & S

LATHES

IN BACK SHOP
AND
ROUNDHOUSE



BACK shop machine tool supervisors have long been familiar with the superior production and precision features built into L & S Lathes. Installations will be found in wheel departments, tool rooms and in other parts of the locomotive shops where quantity and quality production are chief requirements.

Large engine terminals handling classified repairs are also turning to L & S Lathes because the simplified controls and rapid chucking facilities, including the Key Tapered Spindle Nose, provide the versatile features required of a roundhouse lathe handling a large variety of jobs.

THE **L** **S** **MODERN** **ENGINE** **AUTOMATIC** **TOOL ROOM** **OIL COUNTRY** **LATHES** **SHIPLEY** **MACHINE TOOL CO**

CINCINNATI, 25, OHIO, U. S. A.



Eliminate drilling and tapping studs with NELSON STUD WELDING!



Nelson Stud Welding saves time and material because studs are end-welded to metal without drilling or tapping to secure them. Uniform welds, with full fillet, result every time . . . complete fusion between the stud and metal is obtained in 1/2 second.

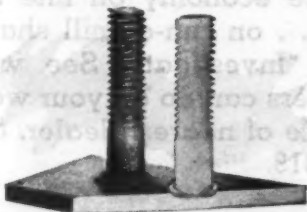
The Nelson Stud Welder is *fully automatic* and completely portable. Light in weight and easy to use, it welds effectively in any position. Or it may be operated as a production unit from a fixed jig. Thousands of these automatic welders are now being used in more than 650 industrial plants. No previous welding experience is necessary.

Write today for complete details about the Nelson Stud Welder, catalog and price list.

After layout and centerpunching the studs are welded to the metal. The stud is inserted in the gun chuck, the trigger pulled and a complete, full-fillet weld results. Operators can weld from 500 to 1500 studs in eight hours without difficulty. A template may be used if desired.



Inspection covers are an excellent application for stud welding because the studs are easily and accurately located without drilling and tapping. Welds are as strong as those made by any other method.



Cutaway view of stud after welding and etching with Nital shows the complete fusion of the stud to metal. Fillet is not only around outer surface of the stud but weld is a complete fusion of the stud to metal.



For complete details, prices and catalog write:

NELSON SPECIALTY WELDING EQUIPMENT CORP.

Dept. R, 440 Peralta Ave., San Leandro, Calif.

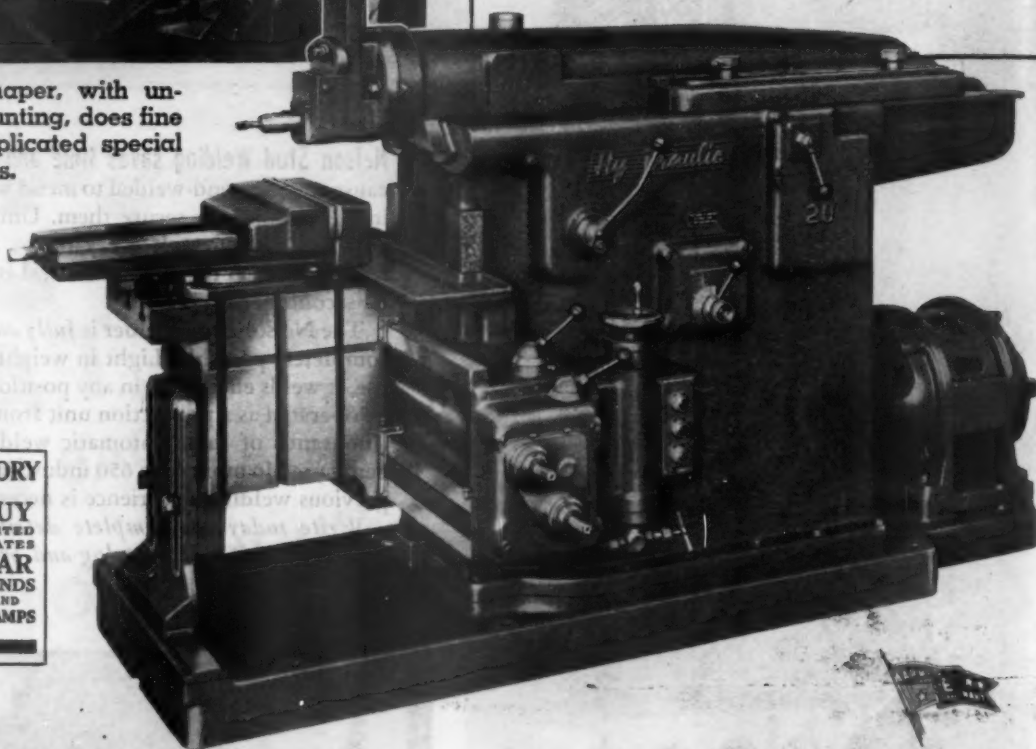
*Eastern Representative: Camden Stud Welding Corp.
Depts. 122, 1416 South Sixth Street, Camden, N. J.*



Hy-Draulic Shaper, with unusual tool mounting, does fine work on complicated special ordnance parts.



4413



Illustrated is a Hy-Draulic Shaper working on special ordnance parts machined from the solid out of very tough steel. The tool-maker running this shaper can concentrate completely on the work in process. Right under his hand are controls for rapid traverses in four directions and for hydraulic cutting speeds and feeds. He can get any cutting speed or feed whatever, in specified ranges, without gaps between, without gear-shifting, without stopping the

Hy-Draulic SHAPERS

Save Time on Tool and Die Work

machine. He can get ram-stroke length, and its position relative to the work, in one easy operation without cranking or using tools. These, and other Hy-Draulic advantages, save operator's time, speed production and promote economy on fine tool and die work . . . on run-of-mill shaper operations also. Investigate. See what Hy-Draulic Shapers can do on your work. Write us for name of nearest dealer, and ask for Bulletin 1919.

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS



ANOTHER TYPE OF ENGINEERED REBUILDING JOB

for faster handling of odds and ends . . .

the truck of a thousand uses



Model B
½ Ton Capacity

the Chore Boy!

The versatility of the BUDA gasoline engine-powered Chore Boy for handling all kinds of materials makes it profitable for 1000 uses. It will carry the load or pull it, or both. With it one man can do the work of three without. Write or wire for descriptive bulletin.

LOW FIRST COST • LOW OPERATING COST • LOW MAINTENANCE COST



RAIL BENDERS

BUDA

15407 Commercial Avenue
HARVEY (Chicago Suburb) ILLINOIS



Model FF—dual wheel
1 ton capacity



JACKS



MOTOR CARS



PUSH CARS

ANOTHER TYPICAL ENGINEERED REBUILDING JOB

by *Simmons*

PRODUCTION LIST			
ITEM NO.	DESCRIPTION	DATE LISTED	DAY NO.
6153	90" Milling Wheel Lathes		
PART NO.	DESCRIPTION	DEL'TY PROVIDED	REMARKS
QTY.			
1	Machine Bed		
2	Machine Tailstock Bearing Surfaces		
3	Machine Spindle Bearing Surfaces		
4	New Headstock Bearings		
5	New 6' Gear Box		
6	Ramsey Chain Drive		
7	Machine Tailstock Quill		
8	Machine Headstock Quill		
9	Two New Centers		
10	New Screws & Nuts for Headstocks		
11	New Screws & Nuts for Tailstock		
12	New Main Drive Pinions		
13	Recut Main Drive for Main Drive		
14	New Pinions and Lids		
15	New Ratchets and Lids		
16	New Feed Arm		
17	Two New Sleeves		
18	New T Bolts		
19	Machine Cross Slide R & L		
20	Machine Intermediate R & L		
21	Machine Tool Slide R & L		
22	Four New Gibs		
23	Four Screws Toolslide & Cross-		
24	slide R & L		
25	Light Cut on Drive Shaft		
26	Light Cut on Reducing Shaft		
27	Machine Bearing Drive End		
28	New Bushing Center Drive		
29	New Bushings Main Pinion Drive		
30	Two New Spacer Washers		
31	Eight New Bolts		
32	Two Space Washers, Cross Slide		
33	Machine Bore Gear, Recut Key		
34			

PRODUCTION LIST			
ITEM NO.	DESCRIPTION	DATE LISTED	DAY NO.
PART NO.	DESCRIPTION	DEL'TY PROVIDED	REMARKS
QTY.			
35	Machine Pin, Bearing		
36	Eight New Jaws		
37	Eight New Dogs		
38	Eight New Adjustable Screws		
39	Eight New T Bolts		
40	Two New Nuts on Cross Slide Screw		
41	Clean up Cross Slide Nut		
42	Two New Combination Feed Screws		
43	Two New Head & Tail Center		
44	Spindle Screws		
45	Two New Rapid Traverse Screw & Nut		
46	Two New Rapid Traverse Collars for Rapid Traverse		
47	Three Spacer Collars for Rapid Traverse		
48	Bushing Rapid Traverse Gear		
49	Two Eccentric Driving Collars, Feed		
50	Two Bearings for Driving Shaft, Feed		
51	Two Collars for Driving Shaft, Feed		
52	Two T Bolts for Drive Shaft		
53	New Coupling for Intermediate		
54	Eight T Bolts Intermediate		
55	Eight Nuts for Bolts		
56	Eight Washers for Bolts		
57	Two Bore & Bush Cross Slide		
58	Brass Plates on Tailstock		
59	All Cross Slides Scraped & Fitted		



SIMMONS MACHINE TOOL CORP.
1825 NORTH BROADWAY • ALBANY 1, N. Y.

MANUFACTURERS OF STANDARD AND SPECIAL-PURPOSE MACHINE TOOLS • ENGINEERED REBUILDING **SIMMONS**

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS BRAKES SHEARS

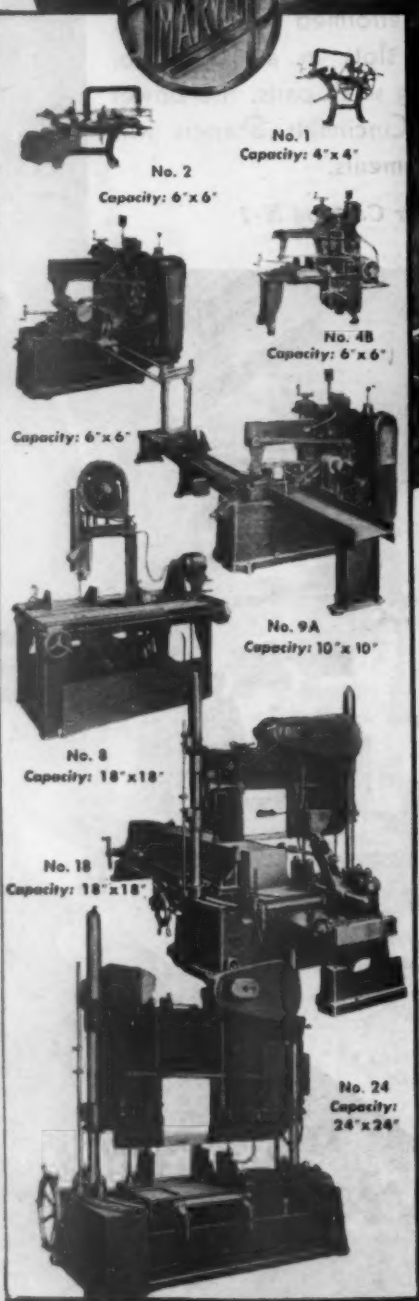
Shaping a 10,000 lb. Plate

The Shaper is recognized as indispensable in the toolroom—but many manufacturing jobs are best performed on Shapers. Whether shaping slots in a 10,000-lb. plate or contouring small parts, the power and accuracy of Cincinnati Shapers will meet your requirements.

Write for Catalog N-2



MARVEL SAWS



Steel Warehousing Company, Chicago, features Prompt delivery

Pieces or lengths cut from bars, tubes or structural shapes can be delivered promptly by this steel warehouse, because they have the MARVEL Saws to handle any cut-off job. Three No. 9A MARVEL Automatic Bar Feed Saws (capacity 10" x 10") which automatically feed, measure and cut-off identical lengths or slices (as gear blanks) from single or nested bars at terrific speed. The fastest hack saws built—these automatic saws require no more operator attention than an automatic screw machine. They are extremely accurate, too, and can be stopped any time in a quantity run, a miscellaneous cut made, and automatic operation resumed by simply re-engaging the bar push-up.

Structural shapes up to 18" and large bars of equal diameters are saw-cut on the No. 18 MARVEL universal Roll Stroke Hack Saws. Cuts are accurately "square" and clean with practically no burrs. This modern saw which is completely armoured to stand the rough handling unavoidable where large work is done, introduces the new roll-stroke principle which enables it to cut-off the toughest steel in the largest sizes rapidly and with extremely long blade life.

ARMSTRONG-BLUM MFG. CO.

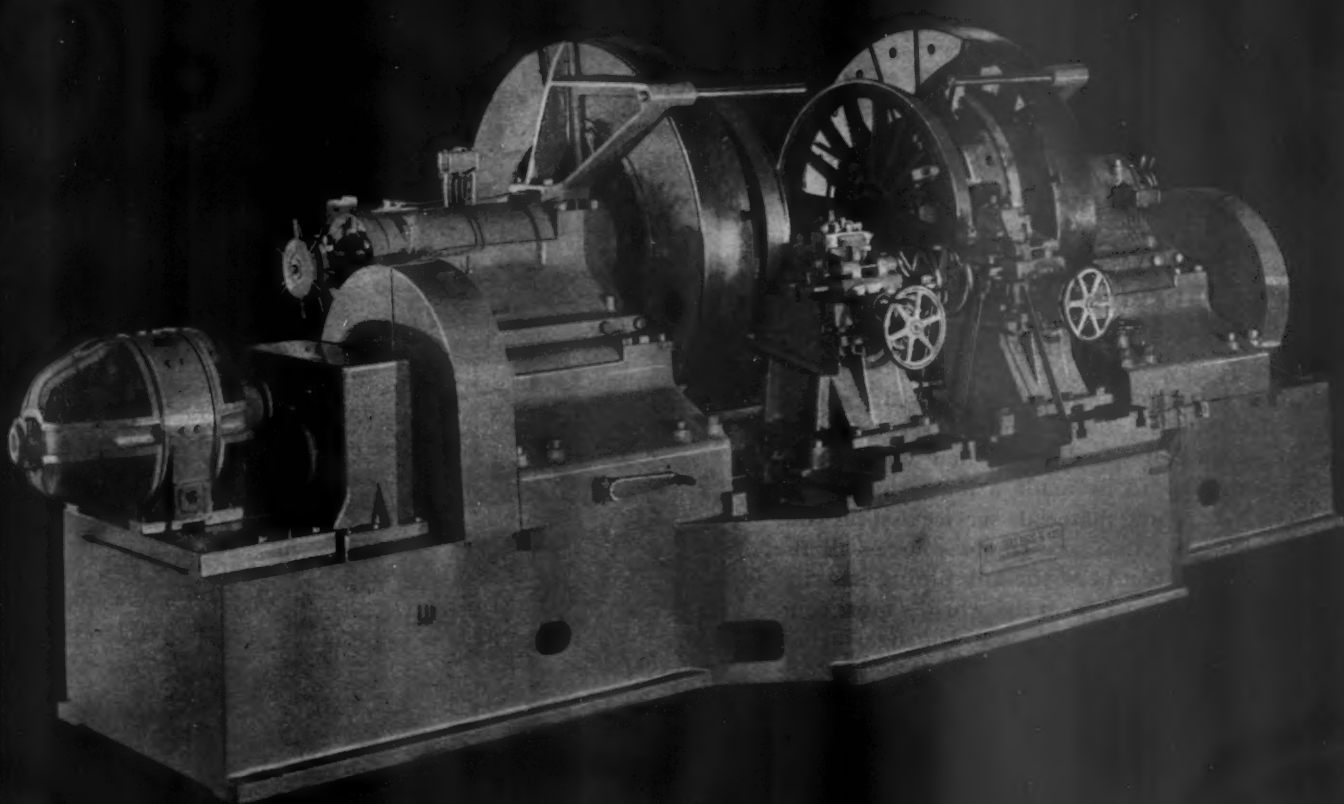
"The Hack Saw People"

5700 Bloomingdale Avenue

Chicago 39, U. S. A.

Eastern Sales Office: 225 LAFAYETTE STREET
New York 12, New York

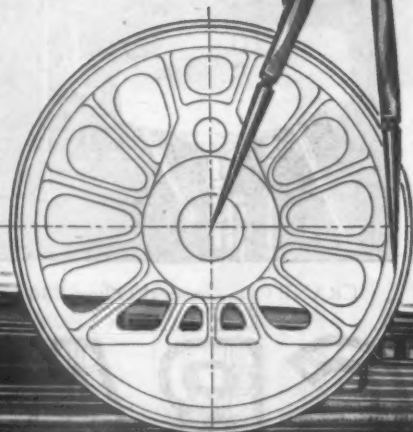
RAILWAY MECHANICAL ENGINEER



It's STILL the Last Word in Driving Wheel Lathes

This Sellers Driving Wheel Lathe bears about as much resemblance to the original as the old wood-burners do to a modern streamliner. Only the painstaking, precise workmanship is the same—workmanship that enables this giant machine to turn out driving wheels whose treads are concentric, smooth and round within the exacting tolerances required by today's high-speed trains. That's **PRECISIONEERING**.

Railroad engineers will appreciate how such accuracy will effect higher speeds, life of locomotives and road-bed maintenance. In fact, accurately turned car wheels and drivers are part and parcel of truly modern railroading . . . Material describing this and other advanced machines in detail will gladly be sent you on request . . . Wm. Sellers & Company, 1631 Hamilton St., Philadelphia, U. S. A.



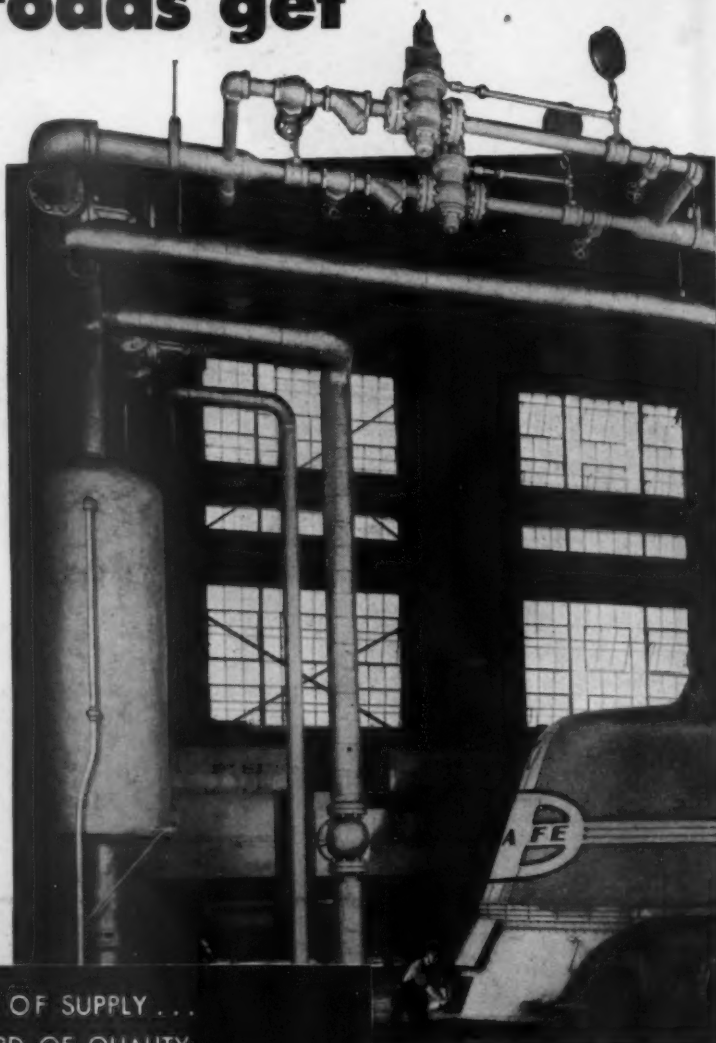
SELLERS

PRECISIONEERING SINCE 1848

What can railroads get from CRANE?

I. Anything in Piping Materials for Rolling Stock, Service and Building Installations

Your job of reconditioning war-weary rolling stock, shops, power stations, service buildings, and of speeding up new construction programs, can be made a lot easier. Crane complete piping materials service assures your getting—through one single source—all the equipment you need for any piping installation. You choose from the world's most complete line of quality valves and fittings, including A.A.R. patterns, pipe and piping accessories, in brass, iron, and steel. All steps of ordering, stores-keeping, and installation are simplified by using Crane materials throughout each job. One responsibility covers all parts and you get full benefit of Crane Co.'s 90-year experience and leadership in satisfying industry's piping needs. Talk this over with your Crane Representative.



Typical Designs in Crane Plumbing for Railroad Service

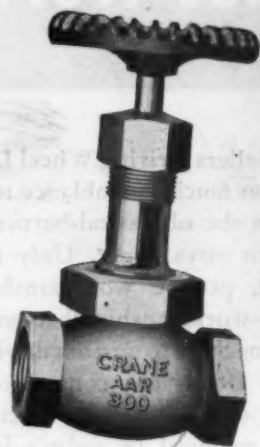


ONE SOURCE OF SUPPLY . . .
ONE STANDARD OF QUALITY . . .
ONE RESPONSIBILITY FOR ALL MATERIALS

Steam service piping in Santa Fe's Diesel Locomotive Maintenance Shop

2. Complete Selections of Plumbing Fixtures for Passenger Cars

To the most discriminating travelers, the name Crane on railroad plumbing fixtures gives assurance of homelike conveniences and comforts. This advantage is available for all your passenger cars—rebuilt and new. The Crane plumbing line includes fixtures in practical designs for all railroad accommodations—each allowing maximum space-saving, but having distinctive features of user appeal. By combining the durable beauty of easy-cleaning vitreous china and operating parts of highest efficiency, Crane plumbing fixtures have won wide preference for railroad service. Ask your Crane Representative about them—for tomorrow's finer train accommodations.



A. A. R. BRASS GLOBE AND ANGLE VALVES

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CRANE



**VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS**

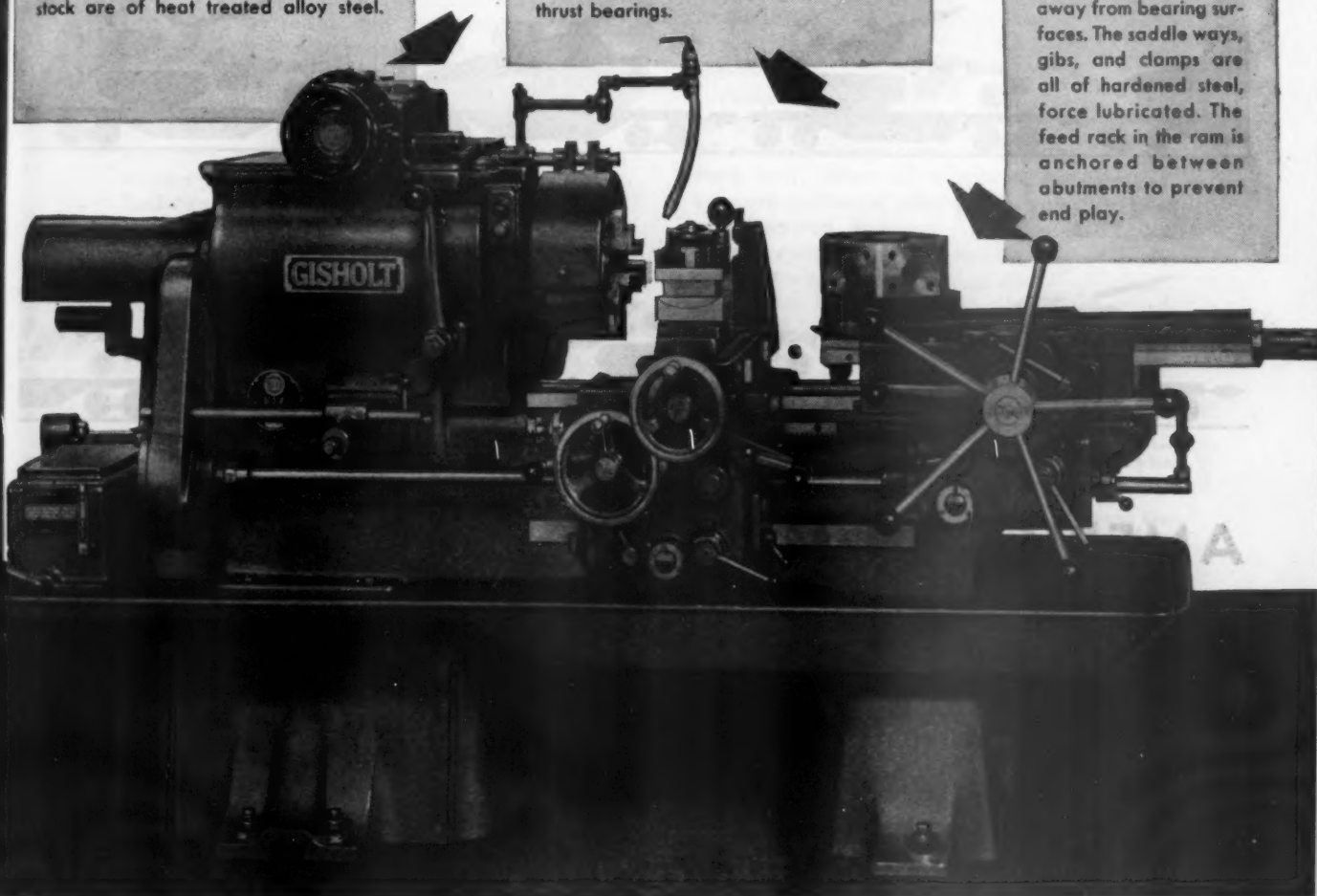
Durable!

**Durability makes these Gisholt Universal Turret Lathes
a sound long-term investment, assures increased
production and lower cost for many years to come.**

1 Headstock lubrication is by oil vapor with filtered oil carried directly to spindle bearings. Tapered roller and ball bearings on the spindle and all shafts preserve accurate alignment. All gears and shafts of the powerful headstock are of heat treated alloy steel.

2 An entirely enclosed apron forming a tight oil reservoir for positive lubrication of gear train by splash and by cascade. Forced lubrication to the hardened steel ways and the cross slide. Large diameter cross feed screw with opposed ball thrust bearings.

3 Husky, automatic turret clamp takes all the wear and strain off the locating pin and bushings. Coolant, scale and chips are carried away from bearing surfaces. The saddle ways, gibs, and clamps are all of hardened steel, force lubricated. The feed rack in the ram is anchored between abutments to prevent end play.



WHEREVER you look into a Gisholt, you'll find special provision for durability. From the rigid, integrally cast bed and headstock, and the wear-resisting, solid, hardened-and-ground steel ways, down to the smallest detail, Gisholts are designed to preserve their accuracy—their full power capacity—their easy oper-

ation throughout long years of service. Perfected over a period of nearly 60 years, ruggedly designed to withstand the demands for higher speeds and harder service, these Gisholts will produce at lower costs now—and years from now.

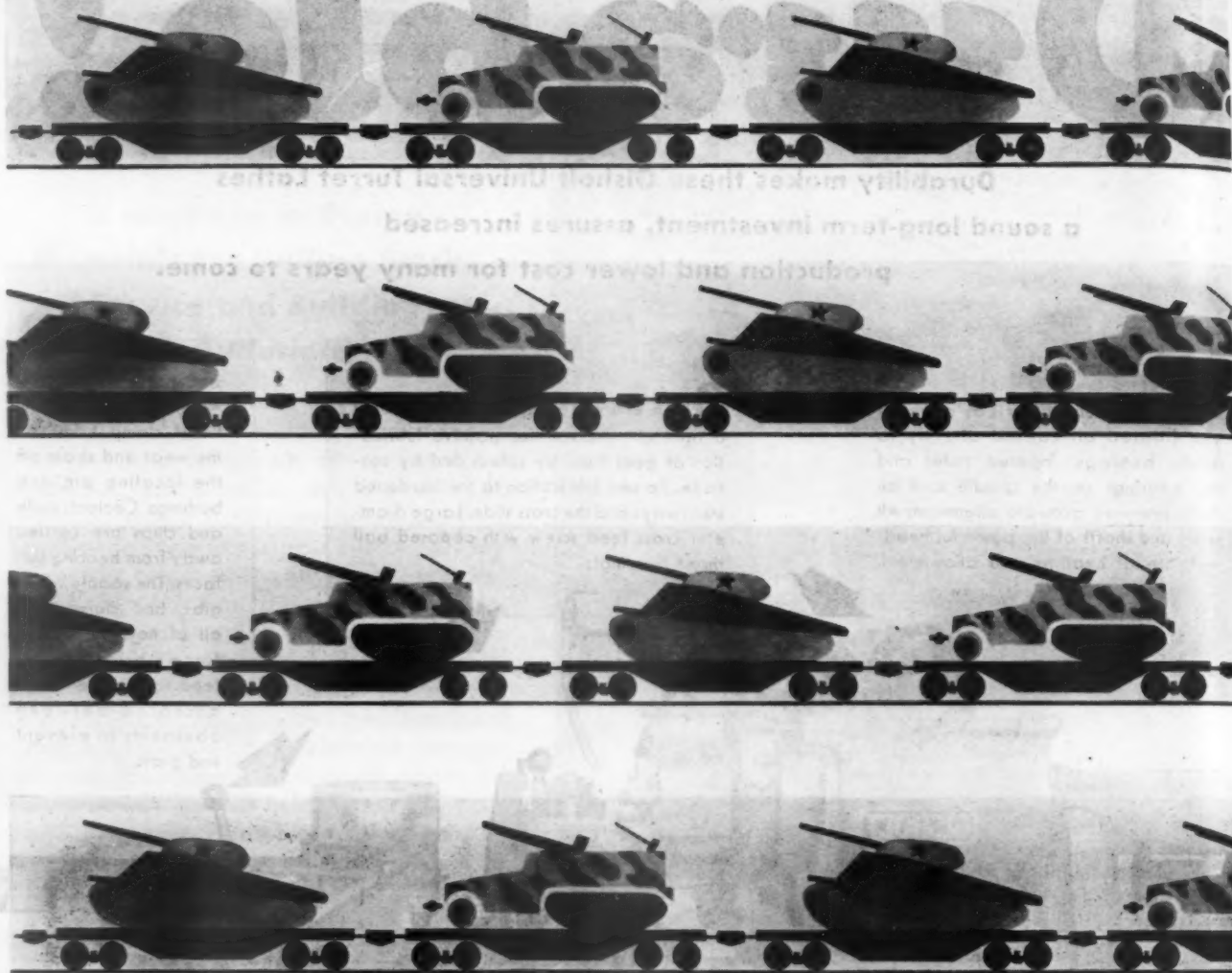
Complete information about Gisholt Turret Lathes is available on request.

GISHOLT MACHINE COMPANY • 1293 E. Washington Ave., Madison 3, Wis.

Look Ahead...Keep Ahead...With Gisholt Improvements in Metal Turning



TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



AMERICA IN MOTION

Back and forth over the country they speed—trains carrying unprecedented loads of vital war materials. There must be no waits between trips—no delays in cleaning operations.

That's why Wyandotte Railway Cleaning Products are in such demand. Specialized to meet *every* cleaning need, they do quick and effective work in

eliminating grit and soot, grease and carbon, oil and dirt deposits.

The Wyandotte Representative is of great service, too, in helping railroadmen save time on the turnaround. His full line of maintenance and backshop cleaners will do the hardest jobs without upsetting any cleaning or washing program. Call on him at any time.

WYANDOTTE CHEMICALS CORPORATION - J. B. FORD DIVISION
WYANDOTTE, MICHIGAN - Service Representatives in 88 Cities



Wyandotte
Reg. U.S. Pat. Off.



THERE is little similarity between the huge, rambling house of the 1880's and today's compact, efficient dwelling. Continued progress in design and construction has made the home of today far more efficient and more economical to maintain than the house of the 80's.

Continued progress has also created the Sullivan Series 100 air compressor, an advanced conception of industrial compressor design and operation. In the Series 100, Sullivan engineers have embodied advance principles of design and have incorporated into an industrial air compressor the same precision construction that characterizes the automotive and aircraft industries.

As a result, the Series 100 compressor, proved by acceptance in every type of industry since its introduction in 1937, is leading a new trend in compressor design. Sullivan Series 100 compressors are compact; they are shipped intact, ready to hook up to air, power and water lines; they are adaptable to electric, diesel or steam power. Most important, however, Sullivan Series 100

air compressors are built to give continuous, heavy-duty, 24 hour a day service far more economically than has ever before been possible.

Only the Series 100 compressor can offer all the advantages and operating economies of modern design and construction. Years from now, when all industrial air compressors are patterned after these, you'll be glad you selected Sullivan. Bulletin A-52 will interest every man who thinks progressively. The nearest Sullivan branch office will gladly send your copy. Sullivan Machinery Company, Michigan City, Indiana. IN CANADA: Canadian Sullivan Machinery Co., Ltd., Dundas, Ontario.

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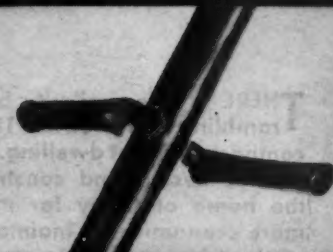
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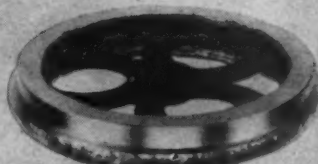
EXTRA SMOOTHNESS is demonstrated in this Cast Iron lug built up with EutecRod 14.



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PERFECT COLOR MATCH of the weld was obtained in this Bronze casting built up with EutecRod 18.

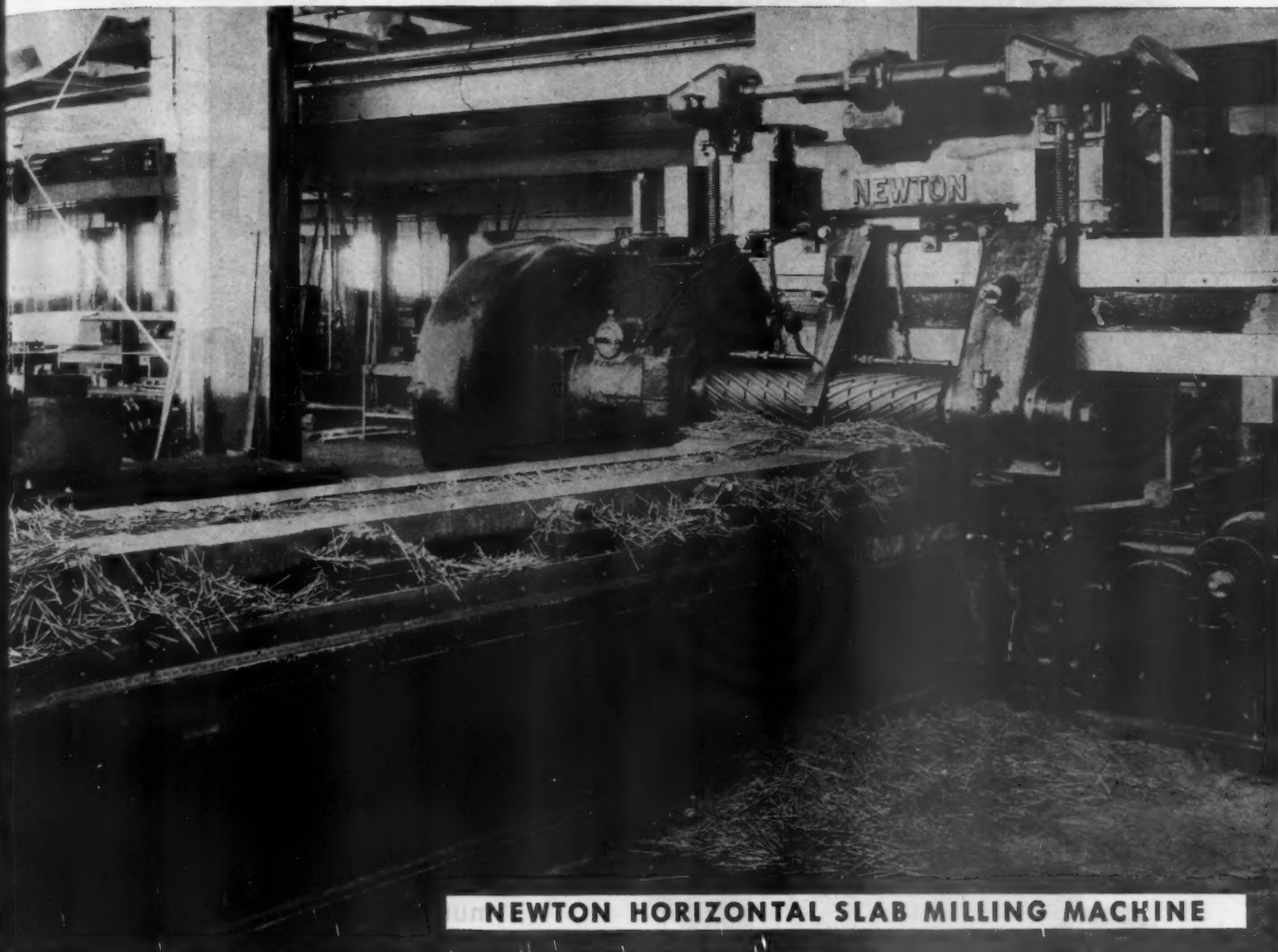


(Above) EASY MACHINING to a smooth finish is demonstrated on this Cast Iron wheel resurfaced with BRONZOCHROM rod 185.



(Below) COPPER TUBE and bronze fitting welded with EutecRod 1800 required no after machining because of smooth fillet formed.

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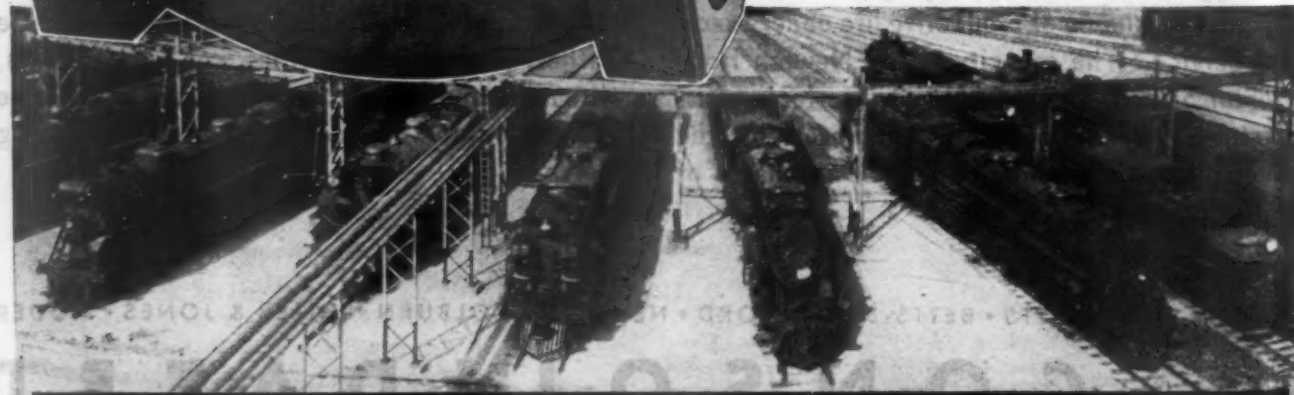
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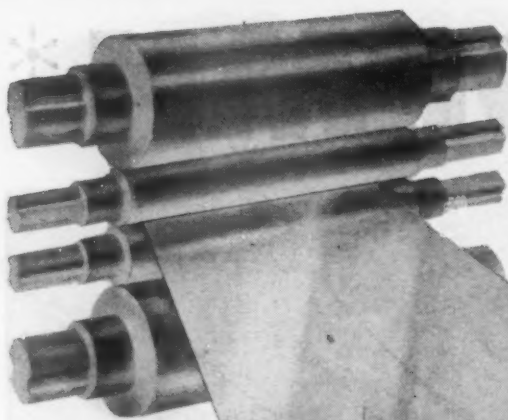
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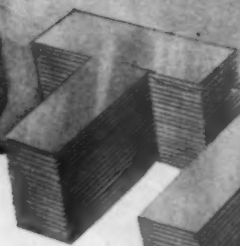
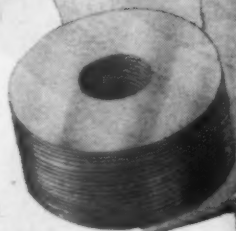


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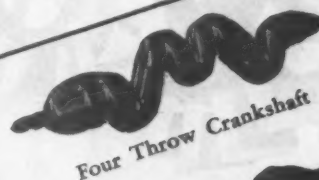
The Economy of Press Forging Automobile and Tractor Crankshafts

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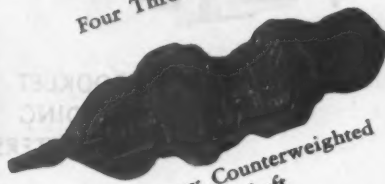
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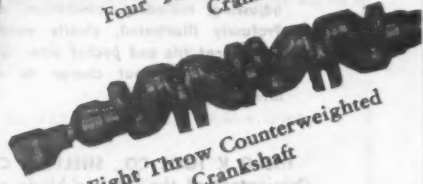
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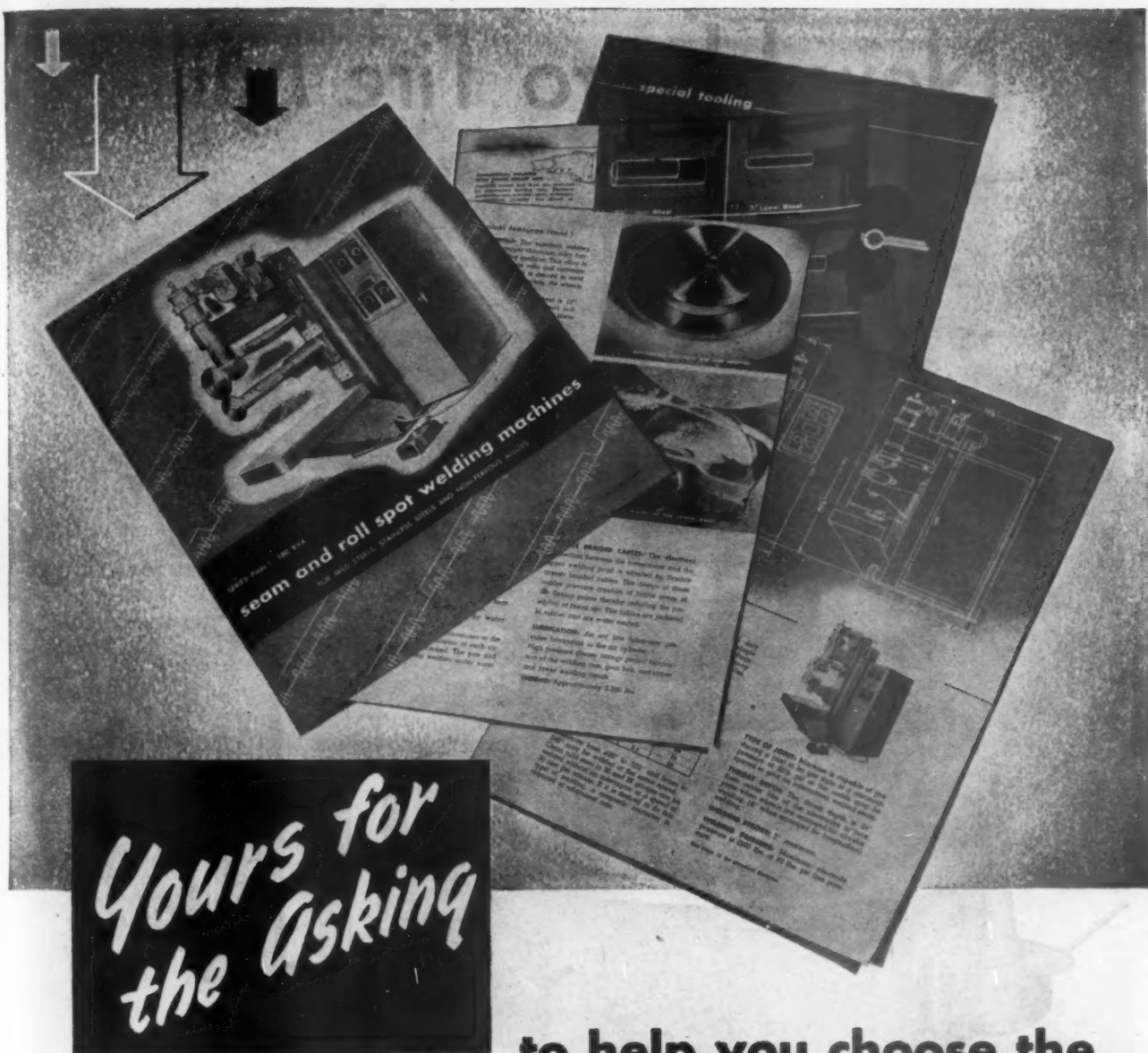


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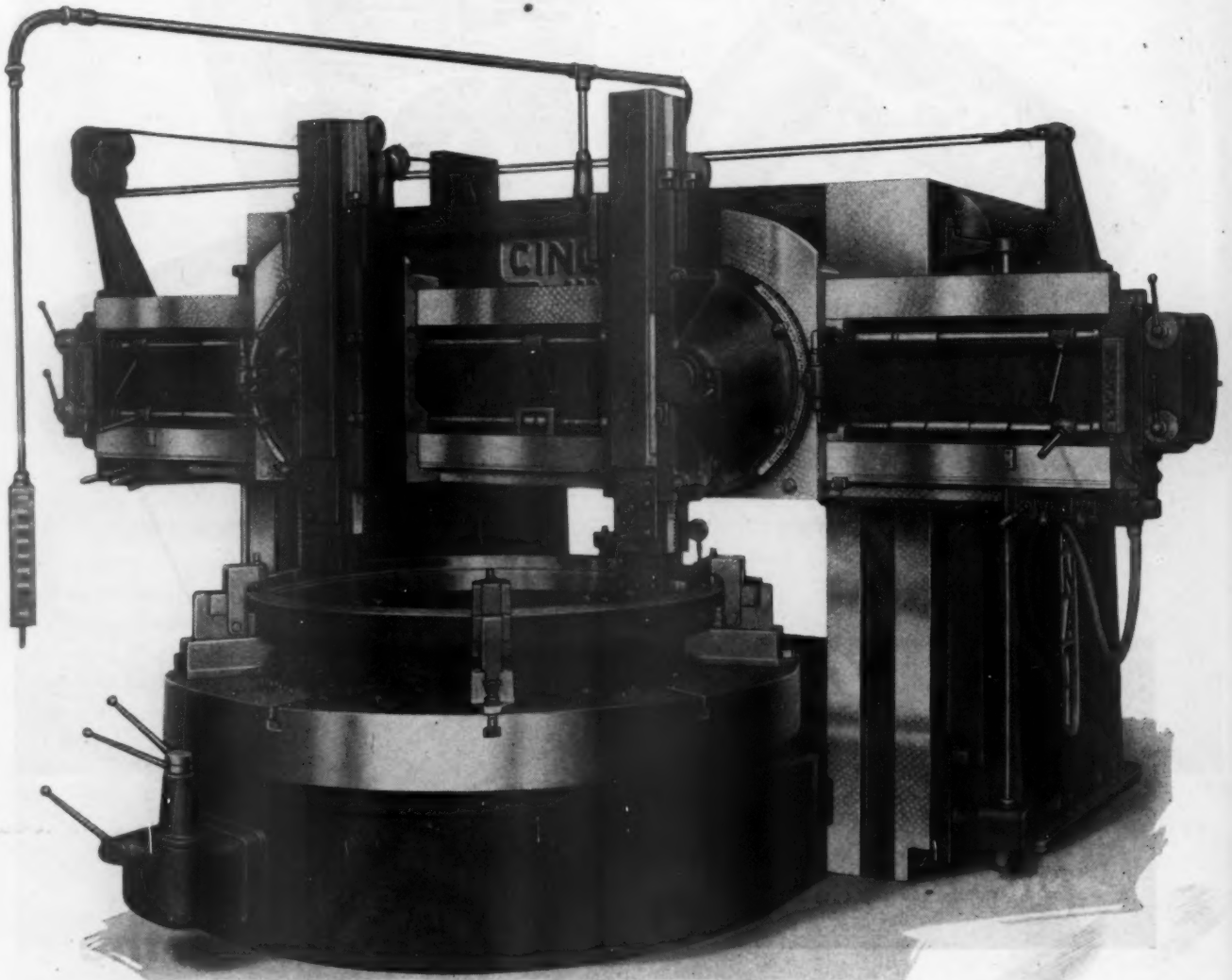
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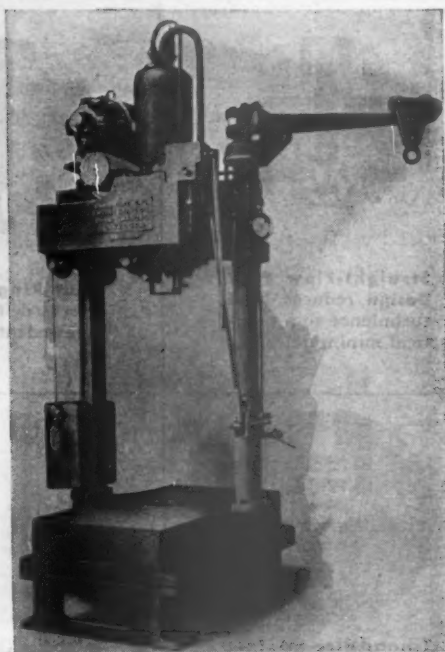


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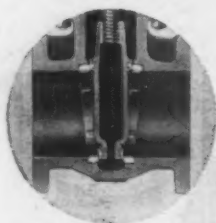
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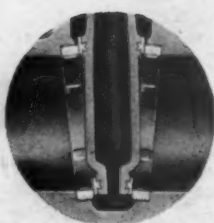
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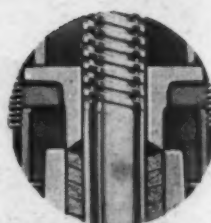
Straight-Flow Port Design reduces fluid turbulence to a practical minimum.



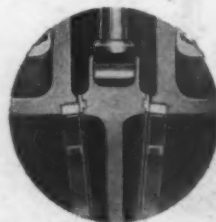
Seat Rings of end-seated type are screwed into the body.



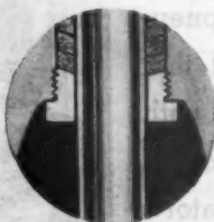
Sure-Grip Malleable handwheel for non-skid gripping even with heavy gloves.



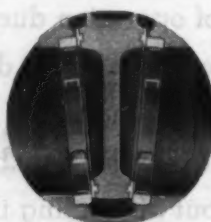
Brass Liner on Glands assures greater resistance to corrosion and scoring.



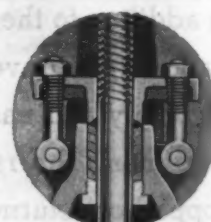
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THE EDITOR'S DESK

PRESIDENT TRUMAN AND THE RAILROADS

President Harry S. Truman is not only familiar with the transportation problems of this country, but he has labored faithfully to develop constructive programs for the regulation and development of the railroads. Ten years ago, when first elected to the Senate, he was assigned to membership on the Committee on Interstate Commerce. He was co-sponsor, with Chairman Wheeler of that committee, for the Senate version of the bill which became the Transportation Act of 1940. More recently he served as chairman of the Senate Special Committee to Investigate the National Defense Program; indeed, it has been familiarly known as the Truman Committee.

In 1938 he was a member of the White House Conference on the railroad problem, out of which developed the report of the so-called Committee of Three, consisting of Interstate Commerce Commissioners Splawn and Mahaffie and the late Commissioner Eastman. He is highly regarded by the Railway Labor Executives' Association, which supported him in his first election to the Senate in 1934 and enthusiastically endorsed him for re-election in 1940.

One of the Truman Committee reports found that the importance of transportation as a war agency had not been adequately recognized and asserted that the wartime experience had indi-

cated "the importance of maintaining a sound and healthy railroad system as an instrument of national defense."

President Truman's attitude toward the coordination of the railroads and transportation systems was rather clearly expressed in an address last year before the Traffic Club of Baltimore. He said: "There are over 750 separate operating railroad corporations in the United States. There has been co-operative action between them in the interchange of equipment and in through rates and through service. Co-operative action is, therefore, proved to be workable without integrated ownership. Such co-ordination can be extended and improved as to railroads and it can likewise be extended to include co-ordination between various modes of transport."

A review of his activities in the Senate and his expressions on transportation problems reveals clearly the fact that he has been a close and discerning student of railroad and transportation problems and recognizes the importance of a broad-minded and constructive approach in solving them.

Roy V. Wright

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Mill which is fitted with three heads—ram, turret and side, will take the heaviest cuts at highest speeds which the best cutting tools will withstand when machining any jobs within capacity. Here is another example why the King Way is becoming the standard way on railroads throughout the country.

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BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY
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Editor, New York

MAY, 1945

Volume 119

No. 5

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points a way to cut
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Two of the main aims of every railroad mechanical department are increasing locomotive availability and decreasing maintenance costs. Byers Staybolt Iron has some special qualities and properties that can help you to realize these ambitions.

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FORGING BILLETS. The same unusually high quality and uniformity found in Byers Staybolt Iron is duplicated in Byers Forging Billets—also at a material saving. They are produced in round, square or rectangular sections, under ASTM-A-73 and AAR-M-307 Specifications.



The blanks are unusually true to size, round and straightness, so there is no difficulty in getting full, sharp threads.

Wrought iron staybolts have proven their ability to stand up under high boiler pressure . . . to resist live fire and elevated temperatures in the firebox . . . to withstand vibration, shock and rapid heating and cooling. A. M. Byers Company is working continuously to keep Byers Staybolt Iron equal to every need.

Byers Staybolt Iron conforms to

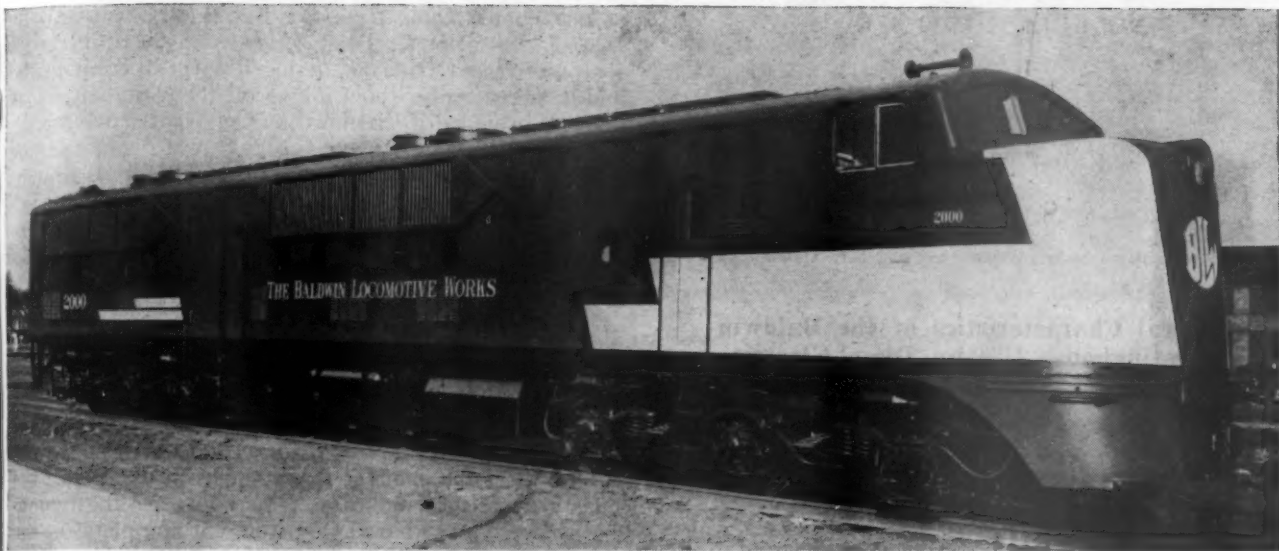
all requirements of AAR and ASTM specifications, and is available through your staybolt manufacturer, or for use in your own shops. Incidentally, we have prepared a wall chart which shows the piling and reduction pattern followed in producing Byers Staybolt Iron. We will be glad to send you a copy on request.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE ALLOY STEELS • OPEN HEARTH ALLOY STEELS
CARBON STEEL TUBULAR PRODUCTS



Baldwin-Westinghouse Builds

4,000-Hp. Road Diesel

FOR the past several months The Baldwin Locomotive Works has been making road tests on a Baldwin-Westinghouse Diesel-electric road locomotive designed for high-speed service. The locomotive consists of A units of 2,000 hp. each, equipped for head-end service. The power plants consist of 1,000-hp. eight-cylinder four-cycle Baldwin Diesel engines, direct connected to Westinghouse generators. The traction motors and control equipment are also supplied by the Westinghouse Electric & Manufacturing Company. The total weight of the A unit is 380,000 lb. and it is carried on two six-wheel trucks. The starting tractive force, at 30 per cent adhesion, is 76,200 lb. The length of the A unit, inside coupler knuckles, is 80 ft.; truck centers are 49 ft.

Arrangement of Equipment

The two 1,000-hp. power plants are located on the center line of the locomotive. The air compressors are located at the rear end of each engine. The air reservoirs and intercooler are mounted underneath the underframe. The blowers for cooling the traction motors are V-belt driven from the engine crank shaft and are located at the forward end of the front engine and at the after end of the rear engine. The fuel and water tanks are suspended beneath the underframe. Motor-driven fans, taking current from the main generators, draw the air for the engine cooling system through shutters in the cab sides, thence through the engine radiators and discharge it through openings in the roof. Radiator shutters and fan motors are thermostatically controlled.

Locomotive consists of two A units, each powered by two Baldwin eight-cylinder, four-cycle Diesel engines

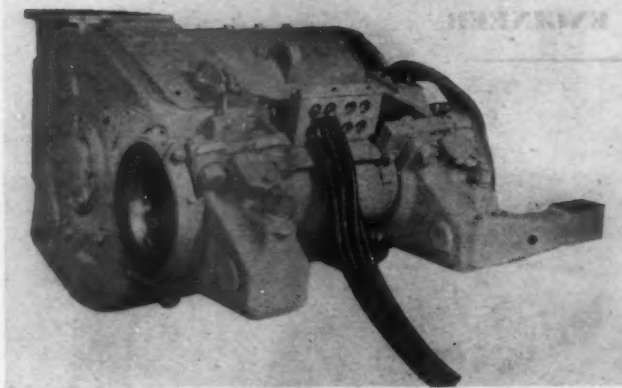
The engineman's operating compartment is arranged at the forward end of the A unit and at the opposite end of the unit is the steam generator and crew toilet facilities.

Underframe and Cab

The underframe of the locomotive is a welded fabricated structure of steel plates and shapes. The principal longitudinal and transverse members are of I section. The superstructure framing is of the truss type and the cab sheets are welded to the framing.

The operator's cab has fixed front windows with combination hinged and sliding side windows. All windows have shatterproof glass. Windshield wipers, defrosters and sun visors are fitted to the front windows. The operator's cab is double sheathed with insulation between the cab sheets. The two doors leading into the engine compartment are metal, with small shatterproof glass ports in the upper part. The cab is heated by steam radiators.

Cab equipment consists of upholstered, adjustable



The traction motors are axle-hung and blower-ventilated

General Characteristics of the Baldwin-Westinghouse 2,000-hp. Diesel-Electric Locomotive (A Unit)

Diesel engines, two, eight cylinders (in line), 1,000 hp. each	2,000
Traction motors:	
Number	Four
Maximum speed restriction, m.p.h.	90
Gear ratio	21:58
Wheels:	
Driving, pairs	Four
Idling, pairs	Two
Diameter, in.	40
Weight in working order, total, lb.	380,000
Wheelbase, ft.-in.:	
Each truck, rigid	15-4
Total locomotive	64-4
Maximum overall locomotive dimensions, ft.-in.:	
Height	14-9
Width	10-6
Length, inside knuckles	80-0
Tractive force, lb.:	
Starting, at 30 per cent adhesion	76,200
Continuous at 21.5 m.p.h.	28,500
Minimum radius curvature, locomotive with train, ft.	359
Fuel oil, gals.	1,200
Lubricating oil, gals.	220
Engine cooling water, gals.	580
Heating boiler water, gals.	1,200
Sand, cu. ft.	30

seats, right and left. On the right side are the engine controls, brake equipment, air gauges, speedometer, wheel slip indicator, train signal, light, bell, horn, defroster and sander controls. The train control signal light box is mounted in the center. The boiler and ground indicating lamps, water and fuel oil gauges and hand brake are located on the left side.

The engine compartment is sheet steel substantially braced with carlines. The roof is steel plate with hatches for power plant removal. Hinged covers permit piston and liner removal without taking off the main hatches. A hatch is provided for removal of the steam generator.

The engine compartment has two side doors and one at the rear leading to the vestibule. Handrails are installed where necessary in the interior of the engine compartment. The exterior handrails, steps and safety appliances comply with I. C. C. regulations.

The Diesel Engines

The Diesel engines are the Baldwin eight-cylinder (in line) four-cycle type developing their rated power at 625 r.p.m. The cylinders are 12¾-in. bore and 15½-in. stroke.

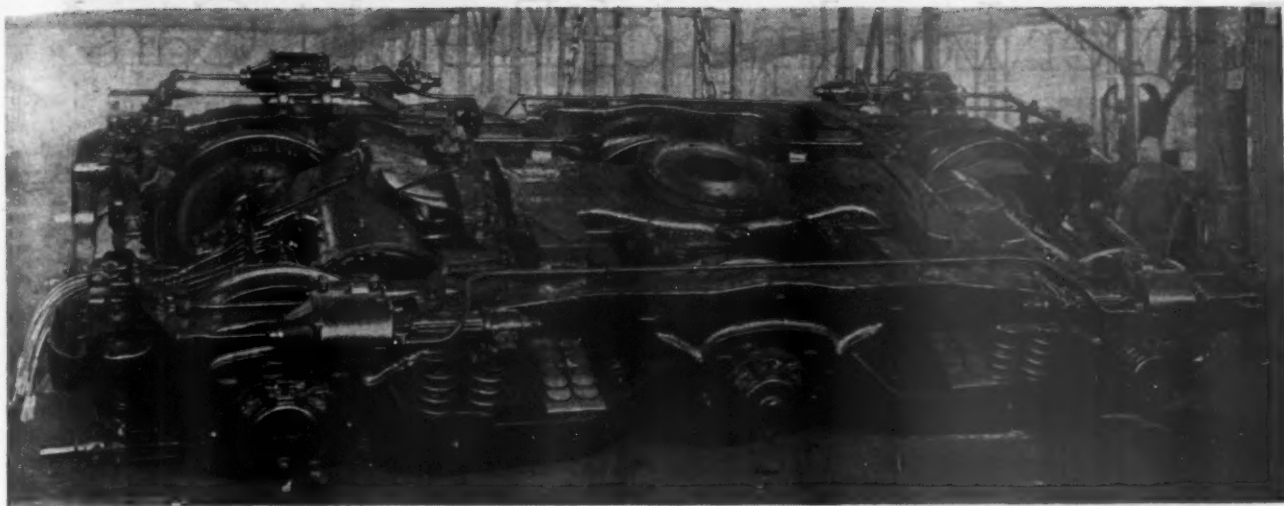
The bed and engine frame are weldments of steel. The frame houses the cylinder liners and is integral with the upper part of the crankcase. The liners are the removable sleeve type of nickel cast iron, chrome plate on the wearing surface. The crankshaft is a solid forging, drilled for lubrication, with 8¾-in. main bearing journals and 8¾-in. crank pins. Main bearings are removable without lifting the crank shaft.

The cylinder heads, embodying the turbulence combustion chamber, are separate castings. The pistons are heat treated aluminum alloy with five compression rings and three oil control rings.

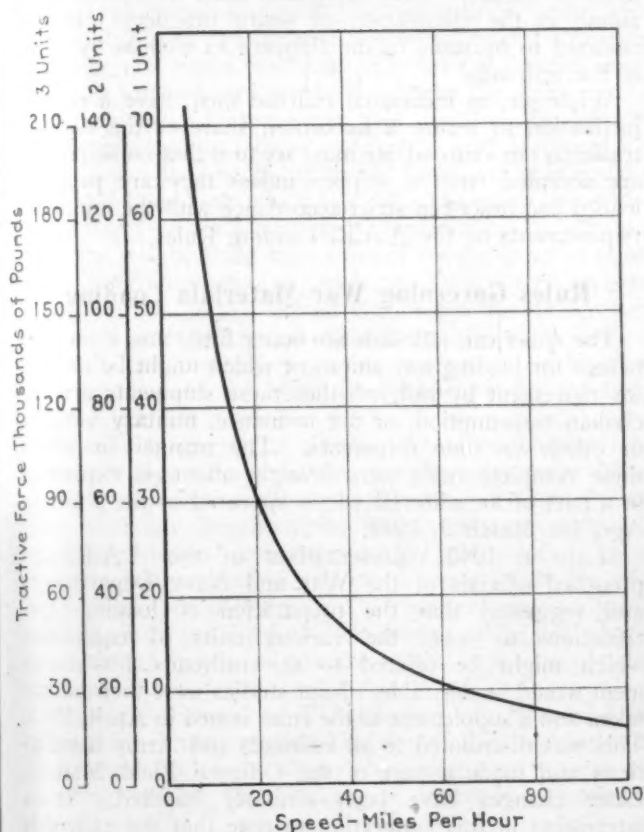
The camshaft is chain driven from the generator end of the engine. The governor, fuel pump, fuel nozzle and lubricating oil filter are on the cam shaft side of the engine. The air intake header and filter, exhaust mani-



The 1,000-hp. power-plant assembly includes engine, main and auxiliary generators and exciter



The traction motors are geared to the outside axles of the six-wheel trucks



Speed-tractive force curve for single and multiple units

fold, muffler, fuel oil filters and transfer pump are on the opposite side.

The valves are alloy steel, located in the heads and actuated by rocker arms. The fuel injection system is the unit injector type with injection pumps at each cylinder. Engine speed is controlled by the governor. An independent overspeed stop is also provided.

Lubrication is by means of pressure pump chain driven from the crank shaft. The oil supply is contained in the bed plate sub-base.

Engine cooling is effected by means of a chain-driven centrifugal water pump which circulates the jacket water through radiators which also have a section for cooling the lubricating oil. Each engine has a radiator assembly

located under the compartment roof. Thermostatically controlled shutters are installed in the engine compartment side walls back of which are the oil and water radiators. There are two independent radiator piping systems, one for each engine; included in which is an expansion tank with pipe connection for filling, draining and stand-by heating.

Electrical Equipment

Two Westinghouse Type 480-B generators furnish power to the four traction motors, one generator supplying power to Motors No. 1 and 2 which are connected permanently in series and the other supplying power to Motors No. 3 and 4. The generator frame is supported
(Continued on page 200)



The underframe and superstructure framing are welded sections—The steel cab sheets are welded to the framing

Proper Loading of Freight Cars*

By A. H. Keys†

DELIVERING the commodities which have been entrusted to the railroads' care quickly and safely to their destination calls for careful observance of the A.A.R. Loading Rules and the supplements thereto. These rules are issued annually and supplemented periodically after careful investigation by tests of suggested loading methods and practices made by practical railroad men who are assisted by and greatly aided through the cooperation of the shippers.

The average shipper, while anxious to load and brace his shipment as adequately as possible, is further interested in having the shipment delivered to its destination as quickly as possible and without damage. He will comply with any bracing or blocking requirement if he is convinced that such bracing and blocking is necessary to insure the safe transportation of his product.

Shippers frequently suggest methods of loading their products where no loading rule has been provided and, in some cases, they even suggest alternate methods to those published in the A.A.R. Loading Rules. These suggestions are referred to the Secretary of the Mechanical Division Association of American Railroads, in accordance with paragraph 4 of the preface to the loading rules, after which they are referred to the chairman of the Committee on Loading Rules and investigated by the various sub-committees dealing with particular products. Investigation by a sub-committee, including the conducting of shock tests, usually results in an authorization for the movement of sufficient trial shipments to assure that the loads are properly and safely secured before the new method is published in the rules. Shippers have cooperated whole-heartedly with the Association of American Railroads by working with the Loading Rules Committee, suggesting new methods of loading and conducting shock tests in their plants. Their efforts and suggestions have resulted in many new methods being devised which have been mutually beneficial to all; the shipper, the customer and the carrier. A splendid spirit of friendly feeling has been created between the railroads and the shippers.

The various car department organizations, including the Eastern Car Foreman's Association, cannot be too highly commended for the active part they have played in cooperating with the shippers in solving their loading problems, and these associations have greatly aided the Committee on Loading Rules, directing their attention to cases where added securement was deemed necessary to eliminate transportation hazards and provide for the safe transportation of a particular commodity.

The activities of the various mechanical committees, appointed by the Executive Vice-Chairman of the Association of American Railroads primarily to police the inspection of cars placed for loading to assure that the equipment was in suitable condition to carry a load and was free from defects which would delay movement to destination, have also been a valuable asset to the Committee on Loading Rules. They have aided in the enforcement of the present rules and pointed out the need for new figures and new specifications for many of the new commodities which the railroads have been called

Safe movement of freight requires full compliance with loading rules — Cooperation of the shippers with carriers now at the highest point ever

upon to handle. They have also been instrumental in aiding in the elimination of sharp practices formerly resorted to by some of the shippers as well as by some of the railroads.

While we, as individual railroad men, have a natural inclination to secure a maximum share of the nation's traffic on our railroad, we must see to it that no shipments are accepted from a shipper unless they are properly loaded and braced in strict accordance with the minimum requirements of the A.A.R. Loading Rules.

Rules Governing War Materials Loading

The American railroads are better fitted now than ever before for loading any shipment which might be offered for movement by rail, whether these shipments are for civilian consumption, or are ordnance, military vehicles or other war-time shipments. The manner in which these complete rules were brought about, is expressed in a part of an editorial which appeared in the *Railway Age*, for March 3, 1945,

"Late in 1940 representatives of the A.A.R. approached officials of the War and Navy Departments and suggested that the preparation of loading specifications to cover the various units of equipment which might be offered to the railroads for movement would be desirable. Joint studies were then undertaken and a supplement to the rules issued in April, 1941. This was distributed to all railroads and Army installations and made a part of the Officers' Field Manual. Later changes have been similarly handled. It is interesting in this connection to note that the railroads initiated this work more than a year prior to our entrance into the war and issued the first instructions about six months before Pearl Harbor. * * *

"Probably no honor will be paid to any of the members of the committee but they can have the satisfaction of knowing that theirs was a job well done which certainly has contributed much to eventual victory. The uninterrupted flow of properly loaded cars to all of our ports is proof of that."

Members of the Armed forces were trained in the loading and bracing of open-top cars in accordance with these rules, with the result that military vehicles were transported in complete trains accompanied by the military personnel direct from the Army installations to ports of embarkation without delay.

Subsequently, it was deemed advisable to issue what is now known as special supplement No. 2 containing

* A paper delivered before the Eastern Car Foreman's Association at New York on April 13, 1945.

† Assistant superintendent car department, Baltimore & Ohio, Baltimore, Md.

rules governing the loading of standard military vehicles not transported in complete trains and not accompanied by or under the direct supervision of military personnel. This supplement was issued to the Army installations, the railroads, and the various manufacturing plants, and has proved invaluable in expediting the shipments moved in regular freight trains to ports of embarkation or to the arsenals where the material is tested or accumulated for further movement to the battle fronts.

The movement of materials of war from arsenals and the various manufacturing plants throughout our country to the ports of embarkation for the loading of a single convoy required a total of 24,483 freight cars. Collecting this material—bringing it hundreds, even thousands of miles—delivering it to shipside on schedule and in pre-arranged order,—doing this day after day, is one of the biggest and most responsible jobs that the railroads have to do. It could not be accomplished without the magnificent cooperation of the shippers, the Navy, the Army, as well as of the port authorities. Yet in back of it all is the railroad car inspector whose duty it is to see that the cars selected to carry these shipments are of sufficient capacity, that the floor is free from defects which would permit the lading to break through or which due to deterioration would not hold the bracing necessary to secure the loads, and that the running gear, the sills and the superstructure of the car itself are in such condition that the car will continue through to destination without delay. After a load is placed on or in a car, the car inspector must see that it is equally distributed so that one truck does not carry in excess of one-half of the load weight stencilled on the car and that the weight along both sides of the car is about equal for the entire length of the load; that loads placed between truck centers do not exceed the weight limitations over specified spaces shown in the table published in General Rule 4, and that all of the requirements for blocking and securing of the loads, as specified under the individual figure, are applied.

The rules governing the loading of commodities on open-top cars are mandatory. No deviation is permitted as the securements shown under the individual figures are minimum requirements based on many years of exacting studies and experimental shipments. It is, however, impossible to provide a specific rule for each and every type of lading. Therefore, where no definite rule has been provided, the securement of the load should conform as nearly as possible to the best example that can be chosen from these rules.

Loading Rules 1 to 39, inclusive, are issued by the Operating-Transportation Division of the Association of American Railroads in pamphlet form and govern the loading, bracing and blocking of commodities loaded in closed cars.

The general rules published in the fore-part of each of these pamphlets are mandatory and, much like the general rules of the open-top code, cover the placement of the lading in the car and the securement required to prevent displacement in transit. Careful observation of these rules is necessary to prevent damage to the shipments and hazards on the railroads. For example, lading may shift sideways in transit, causing derailments, or a concentration of weight may subject the floors of the cars to excessive stresses causing them to break and the lading to fall through.

Munitions Loading

The loading of small arms ammunition, shells of all calibers for the Army and Navy, and bombs of various sizes, are generally handled in closed cars. The loading

of such material, while generally performed by the various manufacturers throughout the country, is under the direct supervision of the Army Ordnance Departments. When the conversion of many pre-war industries to the manufacture of these materials was made, the task of instructing the various shippers with regard to placement and securement of the loads became a problem with which many individual railroads were confronted. In many cases railroad car inspectors were prohibited from entering plants to inspect the loading before cars were sealed. However, with the cooperation of the various ordnance offices, as well as of the plant production managers, arrangements were made to admit the car inspectors to these plants. Assistance and suggestions were also rendered by the various steel strapping and wire companies and little difficulty was experienced after standard rules were set up for the loading of these materials. Pamphlet No. 27 depicts the methods of blocking and bracing the shipments and specifies the size and number of metal straps or wires required to brace these shipments properly. These specifications, like those in the open-top rules, were adopted only after extensive study and experiment.

An outstanding case involved shipments of 500-lb. bombs for the Pacific coast. I was informed by an ordnance office that after 27 carloads of bombs, loaded in strict accordance with the rules, had arrived at destination in perfect condition, six subsequent shipments arrived at destination badly disarranged and damaged. An inspection was made of several cars being loaded at this particular plant and it was found that its stock of 1¼-in. by 0.35-in. high-tension bands, having a load strength of 4,000 lb., had been consumed. The loading foreman had substituted ¾-in. by .035-in. high-tension bands, having a load strength of only 2,500 lb. They did not have sufficient tensile strength and failed in transit. A supply of 1¼-in. bands was procured immediately and no further trouble was experienced at this plant.

Before our entry into the war, to cite another instance of railroad-shipper cooperation, the American railroads were called upon to handle many shipments originating north of the Canadian border for movement to our eastern seaboard for export. Among these shipments were thousands of crated motor trucks and tanks loaded on flat cars and in gondola cars. These crates were placed one on the other to reach the maximum railroad clearance height and it was found that the excessive weight of the crates in the top tier caused a crushing of the boxes loaded on the floor of the car, thereby creating a very hazardous condition. Correspondence with the shipper would have entailed considerable delay, and to expedite the correction of this trouble, representatives of the Loading Rules Committee called on the shipper in Canada where they were courteously received and were allowed to inspect loads being prepared for shipment. This inspection included the crating department where the crates were pre-fabricated before being loaded. A slight alteration in the construction of the crate was suggested. However, the shipper informed the committee that it was not possible to change the construction of any part of the crate, but did express willingness to go to any reasonable expense to place external bracing on the crates after they were loaded on the car. The suggestion was adopted and resulted in the elimination of further trouble with these shipments.

Subsequent investigation developed that the crates used for these shipments were manufactured in compliance with specifications furnished by the British Ministry of War and their construction served two purposes.

The crates were disassembled after arrival at the battle front and the sides, ends, tops and bottoms then were reused without alteration for the construction of barracks, hangers and ammunition dumps.

Deterioration of Freight Cars

The revenue tonnage originating on the lines of the Class I railways has materially increased since Pearl Harbor. Prior to the order of the Office of Defense Transportation that freight cars be loaded to their maximum stencilled load-limit capacity, freight cars were usually loaded only to the minimum-pay-load tonnage. To further emphasize this point, let us consider a 140,000-lb. capacity gondola car with a stenciled load-limit capacity of 158,000 lb. A few years ago this equipment was loaded with an average of 50,000 lb. of steel. Today this same equipment carries an average of 150,000 lb. of steel; usually within a few pounds of the stencilled load-limit capacity, which you will note, represents a 300 per cent increased tonnage per car. Placing this increased tonnage in a car meant that the height of the piles had to be materially increased. With the height and the weight of the pile increased by 300 per cent or more, the number of metal ties used to hold the piles together had to be increased, as experience proved the existing bracing and tying methods were inadequate to withstand the side pressure encountered in moving these loads across the continent. The shippers of steel products, while not objecting to strengthening the methods then being used, requested proof of the necessity for increased securement for their loads.

The Association of American Railroads, with the cooperation of one of the western carriers, invited representatives of the American Iron and Steel Institute to accompany a sub-committee of the A.A.R. Loading Rules Committee to a mid-western interchange for the purpose of inspecting all of the loads being handled through that interchange. This inspection developed that, while some increased securement was necessary, the principal cause of disarrangement of the loads was failure on the part of the shipper to comply with the provisions of the A.A.R. Loading Rules. There was a further failure on the part of the railroads who accepted these loads from the shippers to take exceptions to the manner in which they were loaded.

As a result of this investigation the Loading Rules Committee revised certain rules which were found to be inadequate due to the increased tonnage being placed in the cars. Representatives of the shippers pointed out to their loading personnel the need for greater care in compliance with the loading rules and the need for the increased securements which was being provided. This case indicates the close harmony and the spirit of cooperation which exists between the shippers and the A.A.R. Loading Rules Committee.

While I have pointed out the necessity for increased securement due to the increased height and weight of such loads, let us consider, from a car-construction standpoint, the increased stress placed upon the body bolsters, the diaphragms, the floor supports, as well as the center and side sills of this equipment.

Although freight cars were constructed originally to meet A.A.R. specifications, deterioration has taken place with age. A car with corroded body bolsters and center sills or brash and decayed flooring cannot reasonably be expected to carry the same load as a newly constructed car unless certain reinforcements have been provided to compensate for the deteriorated conditions. The car owners have been called upon by the Association of American Railroads to withdraw such equipment when

it is in such deteriorated condition that it is unsuitable to carry the maximum tonnage until it has been shopped, repaired and suitably reinforced to carry its stencilled load-limit capacity. Where the car owner has determined that the car is unsuitable to carry the maximum load weight, or where the percentages of the stencilled load-weight limits, as shown in the table accompanying General Rule 4 of the A.A.R. Loading Rules, cannot be safely carried, the car owner must, by stencilling on the car and by publication in the Official Railway Equipment Register, indicate that the carrying capacity of the car has been reduced.

It is the duty of the car inspector, when selecting cars for loading, to exercise care and judgment with respect to the physical condition of the car, taking into consideration the weight of the load and the distance which it is to travel. Let us consider a shipper who is going to load five carloads of heavy materials; two of them destined to the west coast, two of them to a nearby city, and the other one for local delivery. Assume that several of these cars have been rebuilt recently and the other cars, while free from actual sill or body bolster failures, have not been conditioned in the shop for a number of years. The car inspector should suggest to the shipper that the cars in the best physical condition be the ones in which the loads are placed that are destined to the west coast, or the longest haul shipments. This plan has been followed successfully by many of the larger steel shippers.

Cooperative Efforts Succeed

The efforts and the cooperation of the various Army Ordnance Departments with the Operating-Transportation Loading Rules Committee in the preparation of adequate rules governing the loading of such commodities in closed cars have meant that the railroads have experienced few cases of failure in the handling of empty and loaded projectiles, bombs, and other high explosive materials which are being transported daily to our ports of embarkation. However, neither the Loading Rules Committee nor the Ordnance Departments can always be sure that their instructions are complied with. This is the job of the car inspector whose responsibility it is to see that in addition to suitable cars being furnished, the requirements of the loading rules for placing materials in the cars and the bracing of such materials is done in strict accordance with these rules.

The Loading Rules Committee can determine the minimum requirements for the loading and bracing of shipments and publish definite and readily understandable rules for the guidance of the shippers and for the railroads but that is as far as they can go. The successful movement of shipments depends on us as railroad men. We must be sure that cars are loaded in strict compliance with the rules.

As railroad men and as officers in the car departments of our railroads, it is our responsibility to know that the inspectors selected to enforce the loading rules and to select the cars on and in which shipments are to be made are competent successfully to perform the duties assigned to them; that these inspectors have a thorough knowledge of the rules; and that they are sufficiently forceful in the performance of their duties to handle their work with the loading foremen at the various loading points and to do so in a tactful manner. If we do these things we will continue to move with dispatch and safety the enormous quantity of material which is so urgently needed by our Army and our Navy, by our own civilian population, and by our neighbors and our allies throughout the world.

Counterbalance Tests

IN MARCH, 1944, a report on Counterbalance Tests of Locomotives for High-Speed Service was issued by the Office of the Mechanical Engineer, Mechanical Division, and Research Engineer, Engineering Division, Association of American Railroads. The report contains over 300 pages. It presents the results of the study of the Committee on Locomotive Counterbalance Standards of the Mechanical Division and of the Joint Committee on Relations between Track and Equipment of the Mechanical and Engineering Divisions, culminating in a series of tests for the measurement of the effects of inertia forces on the locomotive and on the track affected by counterbalancing. This article is based on that report. It is confined to a presentation of the objects of the tests, the test program, and the conclusions drawn from the analysis of the test data.—EDITOR.]

Fundamentally, locomotive counterbalancing involves the balancing of revolving and reciprocating masses in the locomotive mechanism to prevent undue disturbances of the locomotive and without producing conditions which are damaging to the track or bridges over which the locomotive must operate. In reviewing the development of locomotive counterbalancing certain phases or questions have evidently been of continued interest throughout and it may properly be stated that these questions had not definitely been settled at the time the tests described in this report were undertaken. These are:

1. The proper relation or limitation of the amount of reciprocating weight with respect to the weight of the locomotive.
2. The amount of reciprocating weight that can be left unbalanced without undue disturbance of the locomotive.
3. The method of balancing the mainrod, whether statically based upon the scale weight of each end or dynamically based upon its center of percussion.
4. The extent to which it is necessary or desirable to balance the out-of-plane effect of the revolving weights commonly referred to as cross-balance.
5. The extent to which it is necessary or desirable to balance the eccentric cranks and eccentric rods.
6. The amount of dynamic augment that can be tolerated by the track.

Obviously, these questions have assumed increasing importance as the speed of operation of locomotives has increased. The present A.A.R. recommendations for counterbalancing as adopted in 1931 and revised in 1934 were definitely shown to require revision by experiences on several railways with modern high-speed locomotives of the 4-6-4 and 4-8-4 types which kinked rails in regular operation although balanced in accordance with these recommendations. Accordingly, the Mechanical Division of the A.A.R. established a Committee on Locomotive Counterbalance Standards to give this matter thorough consideration, and C. H. Buford, vice-president of Operations and Maintenance Department, established a Joint Committee on Relation between Track and Equipment, consisting of representatives from the Mechanical and

¹Section IV of the report develops a complete mathematical analysis of the action of forces set up by unbalanced rotating and reciprocating weights and the vertical component of piston load due to the angularity of the main rod, including sample work sheets.—EDITOR.

Limits of reciprocating unbalance determined in terms of locomotive weight—Tests include a complete study of the action of forces set up by unbalanced rotating reciprocating weights on the locomotive and track structures

Engineering Divisions, to afford the necessary coordination between the interests of track and equipment on this and other matters.

The first step taken by the Committee on Locomotive Counterbalance Standards was to prepare a comprehensive analysis of the theory of locomotive counterbalancing. This afforded the background and basis for the analytical treatments.¹ It was next decided that extensive field tests should be made of various types of locomotives and careful consideration was given to the plan of conducting these tests.

Test Program

It was decided that the following program should be followed for the tests.

The tests should be conducted on single track so there would be no reason to expect the rail to have better support under one side of the locomotive than on the other. Otherwise, the tests would have to be duplicated, running the locomotive in both directions, in order to determine the relative impacts on the rail under right and left drivers.

The rail should be 100 lb. per yd., a comparatively light section for high-speed main-line use. There should then be no question but what rail stresses in heavier rails would be less than in the 100-lb. section. Also, the higher stresses in the lighter rail section would afford somewhat more accuracy of measurement.

The track should have tie plates, tie and ballast that would afford a standard of rail support comparable with average main-line track and be suitable for 100 m.p.h. speed.

The alignment of the track should be tangent at the test section and should have an alignment and grades each way from the test section to permit test speeds of 100 m.p.h.

It was decided that four locomotives should be selected for the tests, one each of the 4-6-2, 4-6-4, 4-8-2, and 4-8-4 types.

The counterbalance condition of each locomotive selected should be checked and analyzed by the committee method to determine the amount of unbalance producing dynamic augment, the amount of reciprocating compensation and of reciprocating unbalance, and the locomotive should be tested with this counterbalancing (the same as used on the locomotive prior to the tests) to determine its effect on track and its riding qualities.

The main driving wheels of the locomotive should then be rebalanced by the committee analysis to provide the same effective reciprocating compensation and the tests repeated for comparison with the first series.

In order to determine the maximum permissible unbalanced reciprocating weight in terms of the total weight of the locomotive in working order, two additional series of tests should be run with each locomotive with different amounts of unbalanced reciprocating weight so the complete range of reciprocating compensation within feasible limits of operation would be covered.

Each locomotive should be tested at a speed of 5 m.p.h., at diameter speed, and at high speed—as near 100 m.p.h. as possible. In order to secure a good average, five runs should be made at each speed working steam, and at diameter speed five additional runs should be made drifting.

It was decided that test equipment should be obtained to determine the vertical and lateral effects on the track, and the vertical, lateral, and longitudinal vibrations of the locomotive, the lateral thrusts applied by the driving boxes to the frame, and stresses in the main driver pedestal jaws.

Some changes were found necessary or desirable in this test program. However, in general, the tests were carried out in accordance with the program as outlined. Due to the shortage of power as a result of wartime demands, it was not possible to make the proposed tests with the 4-8-4 type of locomotive, but the other three types were obtained.

Test Equipment

Past experience had shown that the dynamic vertical wheel loadings applied to the track could be well determined from measurements of longitudinal strain in the base of the rail. For measuring the dynamic lateral forces, it was decided to use a modification of a roller-bearing tie-plate assembly which had been developed and used successfully on the Pennsylvania.

For determining the effects of counterbalancing on the locomotive it was decided to use accelerometers to measure the vertical, lateral, and longitudinal vibrations, to measure the lateral forces between the driving boxes and frame by special weigh-bar mechanism, to measure the strains in the main driver pedestals, and to measure the strain in the drawbar between the locomotive and the tender. During the course of the tests it was decided to measure in addition the main-rod thrusts, the steam pressure in the cylinders, and the variation of the sprung weight transmitted to the main driver.

Careful study was given to the selection of the type of equipment that would be most suitable. The electromagnetic type of measuring equipment had received the benefit of several years of experience and progressive development. It was considered that this type of equipment had satisfactory characteristics, and in view of this background of development and experience and satisfactory performance would be best suited for test work.

Accordingly, specifications were prepared covering the features that were considered necessary, and the Hathaway Instrument Company was engaged to design and construct the equipment in accordance with the specifications. This equipment consisted of four oscillographs, each capable of making 12 simultaneous records; four control units, each of which was operated in conjunction with one oscillograph, to govern the sensitivity, rectify and filter the output from the gauges; two electronic-type oscillators for providing the necessary 2,000 c.p.s. carrier current for the gauges; 72 magnetic strain gauges, and 10 magnetic accelerometers. Part of this equipment was used for the track measurements and part for the locomotive measurements.

The stretch of main track selected was the same as used previously in conducting counterbalance tests with Chicago & North Western locomotives near Harvard, Ill. This track is part of the C. & N. W. short line between Harvard and Janesville, Wis. Traffic was favorable to the tests on this line since the railway has two single-track main lines between these points and a majority of all trains used the other line. The test track was laid with 100-lb. rail, had good surface, line and tie condition.

A summary of the operation of the three test locomotives while making test runs is shown in the table.

Effect of Counterbalancing on the Locomotive

ACCELERATION OF THE LOCOMOTIVE FRAME

The locomotive frame and the superstructure supported thereon represent a spring-borne mass which is subjected to disturbing forces from the driving mechanism and also from irregularities in the line and surface of the track. Measured rates of acceleration of this spring-borne mass indicate the amounts and directions of these disturbing forces. By obtaining a mean acceleration curve throughout a driver revolution for a number of wheel revolutions and runs, the disturbing forces from track irregularities are averaged out and an indication is afforded of the extent of the disturbing forces due to the driving mechanism alone.

The effect of the amount of reciprocating unbalance on the accelerations of the spring-borne mass of the locomotive is shown in Figs. 1 and 2. In these figures, the maximum range of measured lateral and vertical accelerations is plotted with respect to the amount of unbalanced reciprocating weight.

The front lateral accelerations, shown in the upper portion of Fig. 1, are of moderate magnitude and not greatly different for all three locomotives. In general, there is a small increase in the magnitude of the front lateral acceleration as the reciprocating unbalance increases.

The rear lateral accelerations show a slight increase in magnitude as the reciprocating unbalance is increased for the Santa Fe system locomotive only. Of most significance, however, were the high magnitudes of rear lateral accelerations for the Soo Line locomotive, irrespective of reciprocating unbalance. This was attributed to the low lateral

A Summary of the Operation of Three Locomotives in the Counterbalance Tests

Road	Loco. No.	Type of loco.	Fuel	Diameter of drivers, in.	Total weight of engine in working order, lb.	Weight of reciprocating parts on one side, lb.	Weight of reciprocating parts, per ton of engine weight, lb.	Range of outside temperature, deg. F.	No. of test series	No. of tests run	No. of cars in train	Tonnage of train	Test train road mileage
Illinois Central	2400	4-8-2	Coal (stoker)	73 1/2	362,500	1,946	10.7	30-84	4	171	5	265	1,885
Minneapolis, St. Paul & Sault Ste. Marie	729	4-6-2	Coal (hand)	75	271,100	1,737	12.8	54-92	6	176	3	234	2,369
Atchison, Topeka & Santa Fe	3457	4-6-4	Oil	79	352,600	1,896	10.7	57-95	6	148	5	374	2,073
Totals									16	495			6,327

resistance of the trailer truck which varied from 6 per cent initial to 17 per cent of the weight on the trailer wheels. It is quite evident that other characteristics of locomotive design had far more influence on the rear lateral accelerations than the amount of reciprocating unbalance.

The measured lateral accelerations for each locomotive and each test series showed a definite relation with the calculated nosing couple due to the unbalanced reciprocating weight. This nosing couple is only moderately affected by a relatively large change in the amount of reciprocating unbalance. Furthermore, the engine and trailer trucks may be designed to confine the lateral accelerations within moderate magnitudes even with no

these high magnitudes for Series 4 and 5 may be primarily influenced by the drawbar and buffer characteristics.

The fore-and-aft accelerations were measured for Series 3 and 4 with the Illinois Central locomotive and for Series 2 to 6, inclusive, with the Soo Line locomotive. The measured accelerations corresponded closely with the calculated values based upon the mass of the locomotive and the fore-and-aft shaking force. The measured fore-and-aft accelerations increased with the amount of reciprocating unbalance but were of moderate magnitude.

It seems evident from the test measurements that the fore-and-aft disturbing force, because of its direct effect on the fore-and-aft accelerations and indirect effect on the vertical accelerations, should receive primary consideration in the arrangement of the counterbalancing.

MAIN DRIVER PEDESTAL STRESSES

In Fig. 3 the maximum range of main driver pedestal stress for each test series measured at high speed is plotted for each of the test locomotives with respect to the amount of reciprocating unbalance. In 16 test series with the three locomotives the highest pedestal stress for the locomotive was measured in the left rear pedestal, except in the sixth test series with the Soo Line locomotive.

For all locomotives it was found that simultaneous peak stress values occurred in diagonally opposite pedestals, indicating a twisting of the main driving axle in the horizontal plane and these peak values corresponded closely with the pin position for the maximum calculated nosing

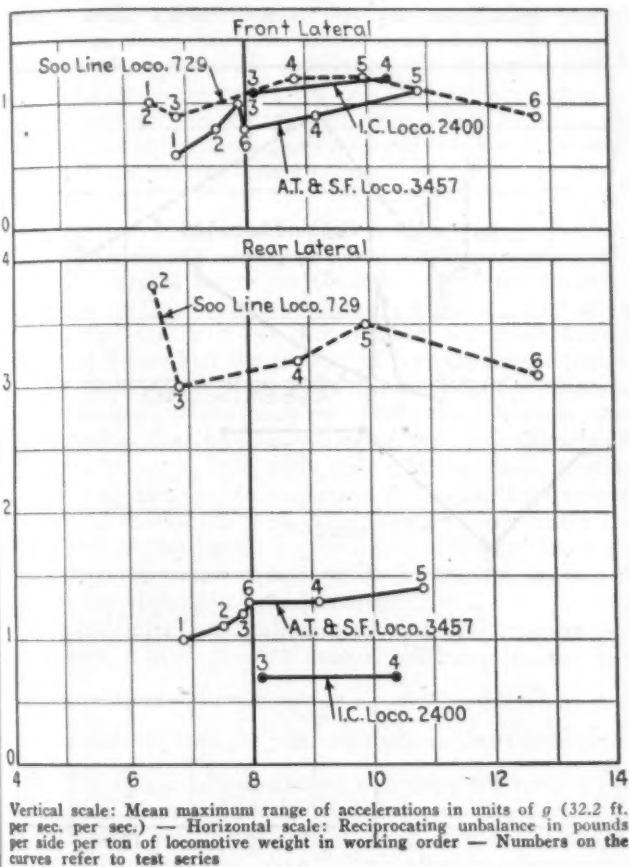


Fig. 1—Lateral accelerations of the locomotive frame — A comparison of the mean maximum for the three test locomotives operating at high speed

reciprocating compensation. It is, therefore, evident that in determining the proper amount of reciprocating compensation for a locomotive, compensation for the nosing movement is of secondary importance.

The front vertical accelerations in the upper portion of Fig. 2 show a definite trend toward higher accelerations with increasing reciprocating unbalance, except for the Soo Line locomotive. The rates of acceleration are not greatly different for these locomotives and may be considered moderate. In the lower portion of this figure showing rear vertical accelerations, the curve for the Soo Line locomotive has been omitted due to the sensitivity of the accelerometer varying during the test. There was a very considerable increase in the rear vertical accelerations of the Santa Fe locomotive for Series 4 and 5 to magnitudes that are excessively high. The rear vertical accelerations appear to have a definite relation to the drawbar buffing force and it seems quite probable that

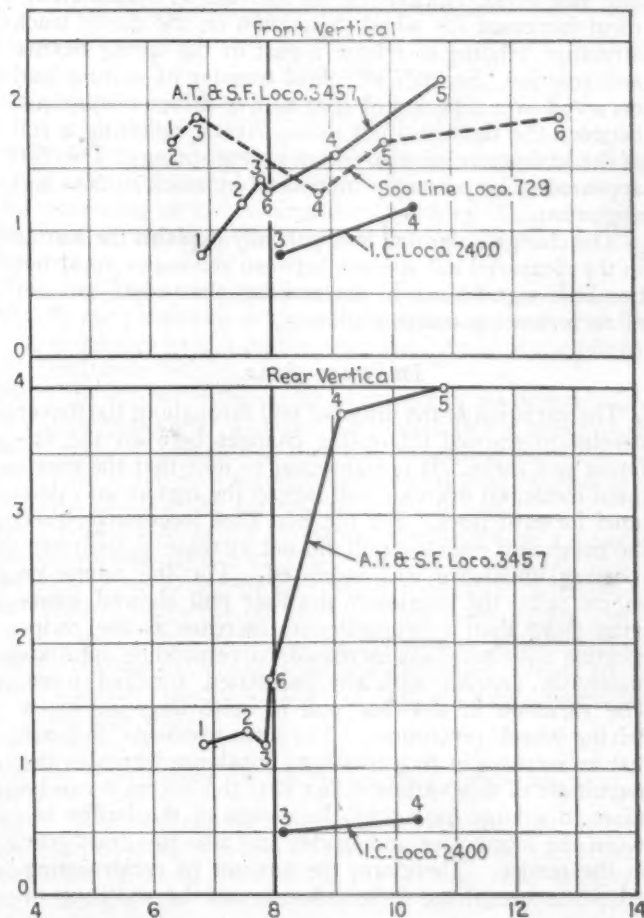


Fig. 2—Vertical accelerations of the locomotive frame — Comparison of the mean maximum for the three test locomotives operating at high speed

couple due to the inertia of the reciprocating weight. The maximum pedestal stresses in the high-speed runs for each test locomotive varied moderately during the several test series, but were no larger than the stresses measured at low speeds when the locomotive was accelerating.

It is apparent that main driver pedestal stresses are influenced by conditions other than the amount of reciprocating unbalance and piston thrust, such as clearances between the driving-box shoes and wedges and rod bushings clearances on the crank pins. In these tests, stresses measured in the main driver pedestals in high-speed operation for all locomotives were not excessive, regardless of counterbalancing.

LATERAL FORCES ON THE LOCOMOTIVE FRAME

For the tests with the Illinois Central locomotive only, the lateral forces exerted by the driving wheels on the frame were measured with specially designed weigh bars. No definite relation was shown between these forces and the amount of reciprocating unbalance, and these measurements were not made for the other two locomotives.

VARIATION OF SPRUNG LOAD ON MAIN DRIVERS

The variation in sprung load on the main drivers showed two principal characteristics. First, a cyclical change occurred during each wheel revolution, the sprung load being decreased as the dynamic augment increased, and vice versa. Apparently, an increase in dynamic augment increased the wheel depression on the elastic track structure, tending to release a part of the spring flexure and reaction. Second, a cyclical transfer of sprung load occurred over a period of four to five driver revolutions, between the right and left main drivers, reflecting a roll of the locomotive superstructure on the springs. This roll appeared to be primarily influenced by track surface and alignment.

The change in sprung load partially explains the scatter in the measured rail stresses between successive runs, but has little significance in determining the proper amount of reciprocating compensation.

DRAWBAR PULL

The variation of the drawbar pull throughout the driver revolution showed interesting changes between the different test series. It is significant to note that the maximum measured drawbar pull lagged the maximum calculated forward force. For the Soo Line locomotive tests, the maximum drawbar pull did not increase as the reciprocating unbalance was increased. For the Santa Fe engine tests, the maximum drawbar pull showed somewhat more than a proportionate increase as the reciprocating unbalance was increased, corresponding approximately in amount with the calculated forward force. The variation in drawbar pull is quite large during a driving-wheel revolution. The measurements indicate that an increase in reciprocating unbalance increases the magnitude of this variation, but that this increase can be offset to a large extent by the design of the buffer between the locomotive and tender and also the draft gear on the tender. Therefore, the amount of reciprocating unbalance need have little influence on the shuttling of the train.

AMOUNT OF RECIPROCATING UNBALANCE

A primary purpose of the tests was to determine the proper amount of reciprocating compensation, and the various test series with the three locomotives included reciprocating compensation within a range of 56 per cent

to 0. Since the extent of the disturbance of the locomotive depends upon its mass and the amount and frequency of the disturbing forces, a good yardstick to use is the amount of reciprocating unbalance per side per ton of locomotive weight in working order. The tests covered a range of reciprocating unbalance from 4.6 to 12.8 lb. per ton of locomotive weight.

The various test measurements with these three locomotives show that the disturbing effects upon the locomotive of the reciprocating unbalance were moderate when the reciprocating unbalance did not exceed 8 lb. per ton. In the judgment of the cab observers, little difference could be detected in the riding qualities for this or a less amount of reciprocating unbalance.

For the test series having larger amounts of reciprocating unbalance, the test measurements show higher

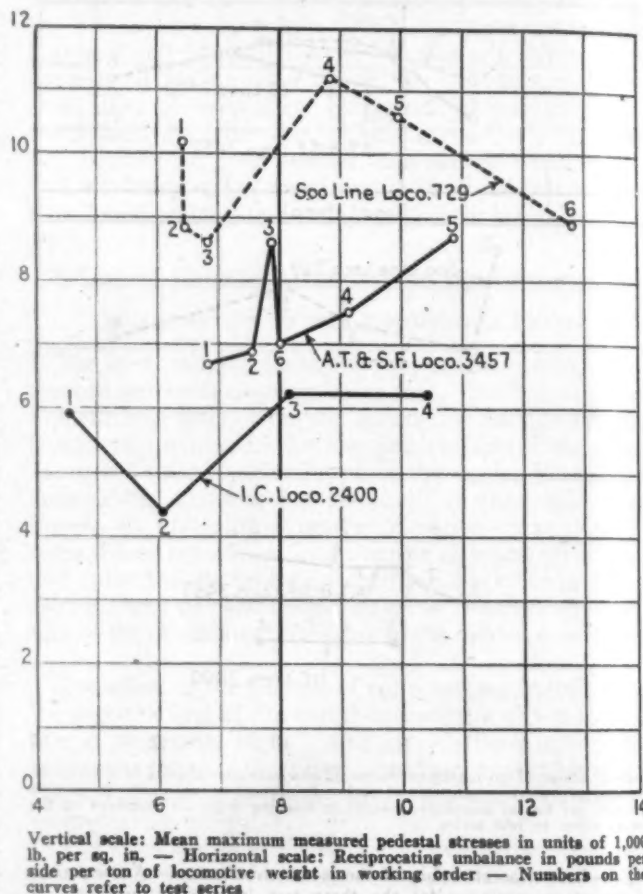


Fig. 3—Stresses measured in the main driver pedestals — Comparison of mean maximum range for the three test locomotives operating at high speed

disturbing effects particularly for the Santa Fe locomotive for which locomotive the rear vertical accelerations were excessively high with 9.1 and 10.9 lb. per ton of reciprocating unbalance. In the judgment of the cab observers the Illinois Central locomotive was rough with a reciprocating unbalance of 10.4 lb. per ton; the Soo Line locomotive somewhat rough with 8.8 lb. per ton, rough with 9.9 lb. per ton, and unsatisfactory with 12.8 lb. per ton; the Santa Fe System locomotive rough with 9.1 lb. per ton and unsatisfactory with 10.9 lb. per ton.

Effect of Counterbalancing on the Track VERTICAL FORCES EXERTED UPON THE TRACK

The vertical forces exerted upon the track at high speed are influenced by the revolving unbalance, vertical component of the main-rod thrust sprung and unsprung

load, and various impact effects not related to the counterbalancing. The amount of the vertical force is indicated by the longitudinal bending stress along the center line of the base of the rail. By plotting the measured stresses for a number of test runs, the mean value of these stresses may properly be considered to average out the impact effects not related to counterbalancing and provide a basis for studying the effects of counterbalancing alone.

The measurements for all test locomotives show a remarkably close agreement in general with the calculated values. It is believed, therefore, that the theory for calculating the resultant disturbing forces may be used with full confidence.

The measured rail stresses obtained in the tests with the various amounts of revolving unbalance in the driving wheels show a definite reduction in the dynamic augment effect as the revolving unbalance is reduced. For very low amounts of revolving unbalance, the dynamic augment effect is entirely negligible. As the revolving unbalance is increased, the dynamic augment effect becomes more and more pronounced until a very decided vertical oscillation of the driving wheel is produced.

LATERAL FORCES ON THE TRACK

The lateral forces on the track were determined by means of special roller-bearing tie plates. For all test locomotives, there was little relation shown between the lateral forces and the amount of reciprocating unbalance. The main driver alone showed a well-defined relation of lateral force to pin position. This lateral force is closely related to simultaneous values of the vertical component of the thrust in both main rods and the couple produced by these components tending to rotate the main axle in a vertical transverse plane. The lateral forces on the track as well as the lateral accelerations of the locomotive are evidently a minor consideration in determining the best counterbalancing of the locomotive.

The leading and trailing wheels of all three locomotives showed a quite definite general tendency to bear to the left.

DISTRIBUTION OF RECIPROCATING COMPENSATION

The measured rail stresses indicating the vertical forces exerted upon the track are helpful in determining how best to distribute the reciprocating compensation among the driving wheels. As the overbalance is decreased, the measured rail stresses show an increase in the amount of scatter. Apparently, the periodic disturbing force from the overbalance tends to break up random impacts not associated with counterbalancing. In the tests there was found to be little advantage in placing less than 100 lb. overbalance in any driving wheel. As the overbalance is increased over this amount, the dynamic augment effect is increased, but was not judged to be excessive up to an overbalance of 200 lb.

The main driving wheel is subject to the two-cycle per revolution vertical component of the main-rod thrust in addition to the one-cycle per revolution variation due to the overbalance. The effect of this is definitely shown in the measured rail stresses. From the standpoint of rail stresses, the tests indicated that it might be advisable to place 50 lb. less overbalance in the main driving wheels than in the coupled wheels to compensate for this effect.

Balancing for the out-of-plane or nosing effect of the reciprocating weight does not appear desirable. The tests have shown that this has little effect on the lateral accelerations of the locomotive. The vertical component of the main-rod thrust has a two-cycle per revolution variation

and it is impossible to balance either it or its out-of-plane effect with a balance weight or weights in the driving wheel. Consequently, balancing the out-of-plane effect of the reciprocating weight would be at the expense of the more important fore-and-aft balancing for a given limitation on the overbalance.

METHOD OF BALANCING

The close agreement of the measured rail stresses with those calculated from the vertical forces determined by analytical treatment serves to verify the accuracy of this treatment. The calculations for the balancing of the main drivers, therefore, should be carried out on that basis.

In balancing the coupled drivers, the only advantage in balancing for the out-of-plane effect of the revolving weights would be to provide more balancing to oppose the nosing effect of the reciprocating weight. Since the tests have shown this to be of relative unimportance, there is no advantage in going to this refinement for balancing the front and rear drivers. For the 4-8-2 type locomotive tested there would be some advantage in balancing the intermediate drivers for the out-of-plane effect if it is greater than 25 per cent of the desired reciprocating compensation. This will tend to keep the dynamic augment effects from each wheel on one side of the locomotive in unison, which is somewhat beneficial from the standpoint of rail stresses.

Regardless of the method of balancing used, the resultant revolving unbalance should be determined for each wheel by the committee method.

Conclusions

METHOD OF BALANCING

High-speed operation of both passenger and freight locomotives requires further refinements in the counterbalancing of locomotives than has been the general practice in the past. The refinements considered necessary are:

a—Determine the rotating equivalent of the main rod by the pendulum or center-of-percussion method and balance this weight on the main pin instead of the full back-end scale weight of the main rod.

b—Consider the center of gravity of the eccentric crank to determine its dynamic component forces acting parallel and perpendicular to the crank-pin diameter.

c—Take into account the eccentric-rod equivalent acting at the small end of the eccentric crank.

d—Transfer the revolving weights into two equivalent revolving unbalance components—one parallel with and the other 90 deg. to the crank-pin diameter in the counterweight plane of both right and left main drivers.

e—Provide sufficient counterweight in both right and left main drivers to offset exactly these components and add the desired amount of reciprocating compensation in each wheel.

AMOUNT OF RECIPROCATING COMPENSATION

The test results have definitely shown that within the limits of 56 per cent to zero reciprocating compensation, that is, from 4.6 to 12.8 lb. per ton reciprocating unbalance, the disturbing effects on the locomotive are somewhat increased as the reciprocating compensation is reduced. These disturbing effects were judged to be undesirably high when the reciprocating unbalance was more than 8 lb. per side per ton of total locomotive weight in working order.

The test results have also shown that an overbalance of 100 lb. per wheel for all drivers shows a very low

dynamic augment effect on the track and little advantage of a smaller unbalance is indicated. The dynamic augment effect increases as the overbalance is increased, but was not judged to be excessively high up to 200 lb. overbalance per wheel. Beyond 200 lb. the dynamic augment effect on the track became undesirably high.

Because of the added disturbing effect of the vertical component of the main-rod thrust, some advantage may be obtained by placing 50 lb. less overbalance in the main driving wheels than in the coupled wheels.

By the use of lightweight reciprocating parts in the construction of new locomotives or modification of existing locomotives, it will be possible to stay well within both of these limits and provide a balancing which will give very favorable effects on both locomotive and track, in so far as the disturbing forces from the reciprocating weight and dynamic augment are concerned, up to operating speeds equal to 1.5 times diameter speed. For locomotives having small diameter driving wheels, the use of lightweight side and main rods, in addition, may make it possible to provide the desired balancing of the main drivers.

Related Matters

The tests have definitely indicated that the characteristics of the engine and particularly the trailing trucks and of the drawbar and buffer between the locomotive and tender have a very important influence on the riding qualities and vertical and lateral accelerations of the locomotive at high speed.

Baldwin-Westinghouse 4,000-Hp. Road Diesel

(Continued from page 191)

from the engine bed plate and the armature is connected directly to the crankshaft. The armature shaft has one self-aligning roller bearing. A multiple Vee pulley on an extension of the armature shaft drives the auxiliary generator-exciter set which is mounted on the main generator frame. A starting field on the main generator permits starting the engine from the battery.

The four Westinghouse 370-B traction motors are nose suspended and geared to the outer axles in each truck. The gear ratio is 21:58 and the maximum speed 90 m.p.h. The motors are force-ventilated, the air being supplied by separate fans blowing air through the center-pin and truck frame. Class B insulation is used on both motors and generators.

The auxiliary generator of the generator-exciter set supplies power for charging the 56-cell storage battery, and the control and lighting circuits. A voltage regulator holds a constant voltage on the auxiliary generator at all engine speeds. The exciter is of the differential type and furnishes power for exciting the fields of the main generator. It serves properly to load the engine in conjunction with the engine control load regulator. It is also wound with Class B insulation. The control is electro-pneumatic and provides for two steps of field shunting. Transition from full field to shunted field is automatic. The governor operator is of the pneumatic type, a movement of the throttle handle resulting in a corresponding movement of the governor operators on each of the two engines. Loss of lubricating or fuel oil will automatically shut down an engine.

The unit switches connecting the generators and traction motors are of the electro-pneumatic type and are

Partial List of Material and Equipment on the Baldwin-Westinghouse 4,000-hp. Diesel- Electric Locomotive

Power Plant:	
Fuel injection system	Bendix Aviation Corp., Scintilla Magneto Div., Sidney, N. Y.
Lube oil filter	Puralator Products, Inc., Newark, N. J.
Engine governor	Woodward Governor Co., Rockford, Ill.
	Pickering Governor Co., Portland, Conn.
Air filters	Burgess Battery Co., Acoustics Div., Chicago
Mufflers	Maxim Silencer Co., Hartford, Conn.
Radiator shutter control	Minneapolis-Honeywell Regulator Co., Minneapolis 8, Minn.
V belts	Dayton Rubber Mfg., Dayton 1, Ohio
Radiators	Modine Mfg. Co., Racine, Wis.
Air compressors	Gardner-Denver Co., Quincy, Ill.
	Westinghouse Air Brake Company, Wilmerding, Pa.
Radiator fans	Buffalo Forge Co., Buffalo 4, N. Y.
Cab windows	Hunter Sash Co., Inc., Flushing, N. Y.
Defroster fans	Diehl Mfg. Co., Somerville, N. J.
Sanders	The Prime Manufacturing Co., Milwaukee 4, Wis.
Headlight, classification lamps	The Pyle-National Company, Chicago 51, Ill.
Air horn; brake equipment; intercooler	Westinghouse Air Brake Company, Wilmerding, Pa.
Operating compartment seats	Heywood-Wakefield Co., Gardner, Mass.
Speed indicator	Jones-Motrola Sales Co., Stamford, Conn.
Vestibule curtain	The Adams & Westlake Co., Elkhart, Ind.
Pipe covering; soundproofing	Johns-Manville Sales Corp., New York
Couplers	Buckeye Steel Castings Co., Columbus, Ohio
Draft gear	W. H. Miner, Inc., Chicago
Steam generator	Vapor Car Heating Co., Chicago 4
Steam-heat connectors	Barco Manufacturing Co., Chicago 40
Roller bearings	SKF Industries, Philadelphia, Pa.
	Timken Roller Bearing Co., Canton, O.
Truck wheels; truck-axles	Standard Steel Works, Division of the Baldwin Locomotive Works, Philadelphia, Pa.
Trucks	General Steel Castings Corp., Eddystone, Pa.
Truck brake equipment	American Brake Div., Westinghouse Air Brake Company, Swissvale, Pa.
Hand brake equipment	National Brake Co., New York

equipped with blow-out coils and arc chutes. The reversers are also electro-pneumatic and magnetic type contactors are used for the field circuits. Wheel slip relays automatically reduce power when wheels slip and give an audible indication in the operating cab.

Trucks, Draft Gear and Miscellaneous Equipment

These locomotives are carried on General Steel Castings Company's six-wheel pedestal type trucks having one-piece frame construction, side equalizers, coil springs and with the swing bolsters carried by elliptic springs at the four corners of the bolster. The front and rear axles of each truck are the driving axles, the center axle being an idler. Motor ventilation is through the center pin. The brakes are of the clasp type with flanged brake shoes. The brake cylinders are located on the truck frame. The axles are mounted in roller bearings. The truck wheels are 40 in. in diameter.

The operating brake equipment is Westinghouse Air Brake Company's Schedule 24-RL with pedestal brake stand and self-lapping brake valve. Automatic and straight air brakes apply on all wheels with train line connections at both ends of each locomotive unit. A hand brake is connected to one truck, with the operating lever in the engine compartment. Air is supplied by a two-stage compressor at each power plant having a displacement of 115 cu. ft. at 625 r.p.m. and 46 cu. ft. at the idling speed of 250 r.p.m. Three reservoirs having a total capacity of 44,530 cu. in. are suspended from the underframe.

Friction draft gear is applied to both ends of the locomotive.

Train heat is supplied by a Vapor-Clarkson steam generator having a capacity of 2,500 lb. per hr. This unit is self contained, with automatic controls and necessary gauges.

Testing Modern Trucks for

High-Speed Freight Service*

THE need for freight-car trucks that would deliver safe, easy-riding service under modern operating conditions was brought out very forcibly in the series of high speed tests made by the Association of American Railroads in 1939 on the Pennsylvania Railroad between Altoona, Pa., and Lockhaven. The results of these tests, in general, indicated the need for further development to achieve satisfactory trucks for freight service at speeds over sixty m. p. h.

The American Steel Foundries has long been active in the development of freight car trucks, and much of today's excellence in the quality, strength, endurance, and economy of modern cast-steel side frames and truck bolsters is due to this development activity over the past forty years or more. That work aided in making possible the

By C. L. Heater†

Service testing provides the data needed in designing of improved freight-car trucks—Truck designs a compromise between various non-controllable cost and engineering factors



The observer operates a coding switch which marks 13 charts simultaneously

further development in modern trucks by minimizing the truck designers' concern over details of side-frame or bolster design. Thus we have been able to concentrate on the later and broader problem of providing safe, easy riding.

In our approach to the development of freight-car trucks for modern service, which is high-speed service, we feel that there are five basic requirements for such trucks: Safety, easy riding, low first cost, low maintenance, and light weight.

Safety needs little elaboration. Any truck today must be safe from the standpoint of structural strength and from the standpoint of truck operation or behavior for speeds up to 100 m. p. h. under any load which it may be expected to carry. Only careful testing, corroborated by actual service, can determine safety.

Easy riding does not necessarily mean riding qualities that compare with passenger equipment. It does mean the elimination of harsh, sharp shocks and the reduction of other impacts to the point where freight lading will not suffer damage due to truck action. There are two design

factors requisite for easy riding—long travel springs and proper control of spring action.

Low first cost is an objective for any product, and here it assumes importance because the freight car is a revenue-producing unit and there are limits, arbitrarily established, upon its earning capacity in the form of freight rates. Obviously, therefore, there are limits upon its initial cost.

Low maintenance is essential in freight trucks for obvious reasons. They cannot be periodically maintained by the same crews at fixed points, they must be easily inspected and handled through repair points, they must be inexpensive to maintain, and they must be sturdy; so, all of these, and many other lesser reasons, demand simplicity.

Light weight is required to maintain an economical ratio between dead-load and revenue load in freight-carry-



Floor windows are located in each corner of the car for observing truck action

*A paper presented before the Eastern Car Foreman's Association in New York on February 9, 1945.

† Vice-president engineering, American Steel Foundries, Chicago.

ing equipment. Modern train service makes this increasingly important.

With these fundamental requirements in mind, we established an objective for a continuation of our testing and development—to develop a freight-car truck meeting fully all of the five fundamental requirements but within the general price and weight range of the ordinary conventional freight car truck.

To do this required design, production and testing experience and, in addition, road testing equipment and facilities. We had the experience background; so, following the A. A. R. 1939 tests, we followed the A. A. R. suggestion and acquired the equipment we lacked for this purpose.

Equipment on Test Cars

We purchased two A. A. R. standard 50-ton box cars and equipped them as a service laboratory for testing trucks at any speed or load or under any conditions under

by indicating speedometers located in each car. All significant points along the course of the test are simultaneously recorded on all of the charts, of which there are thirteen operating during test runs, by an observer who operates a coding switch which makes possible accurate point-by-point comparison of all chart records. To supplement the instrument determinations, close observation of truck action is made possible by four large windows in the floor of each car over the trucks. Flood-lighting equipment permits night or day testing.

One interesting feature of the test equipment is the method of lading. For lading we utilize cast-iron blocks weighing about two tons each and, by the use of hoists and a monorail system, the two cars can be loaded or unloaded completely in about four hours with four men. This greatly facilitates testing and also enables us to duplicate loads and distribution of load exactly in any desired combinations. Normally, testing with a light car and again with the full rail load gives sufficient data to eval-



Instrument recording platform and table

which freight cars might be expected to operate. The instrumentation of these cars is as complete as we could make it, and we are still constantly improving it. Duplicate sets of two types of accelerometers are mounted at each end of each car on rigid plate supports anchored directly to the body bolsters. This eliminates any errors or variables due to floor conditions and affords an accurate determination of the relative performance of the trucks themselves under both cars. One set of accelerometers measures vertical impacts only, normally in terms of .25G, .50G, .75G, and 1.25G, and the other measures vertical, lateral and longitudinal impacts or accelerations and charts them graphically without differentiation as to numerical value. The accelerometer readings are charted continuously.

Truck spring deflection is measured continuously on one truck on each car and is charted. Deflections are recorded for both groups simultaneously, indicating the effect of roll, rail joints, etc. Speeds are charted by a recording speedometer and are also shown continuously

uate truck performance, although frequently tests are also made at intermediate loads.

Test Runs

We were fortunate in being able to start our performance and development testing with the same ideal test train consist that was used in the A. A. R. 1939 tests. We also used the same design of datum truck on the base car; so, our work really was a continuation of the A. A. R. tests. First testing on the Chicago, Milwaukee, St. Paul & Pacific between Milwaukee and Portage, Wisconsin, 91 miles, from August through November, 1940, 56 test runs totaling 9,630 miles, at various speeds, the maximum being 96 m. p. h., were made. With the same special test-train on the Missouri Pacific from Little Rock to Bald Knob, Ark., 50 miles, 72 test runs, totaling 7,200 miles, were made, some at customary freight speeds with maximum rail loads but again principally at higher speeds with a maximum of 86 m. p. h.

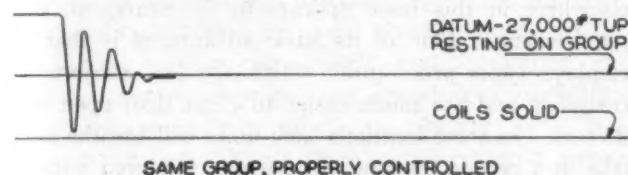
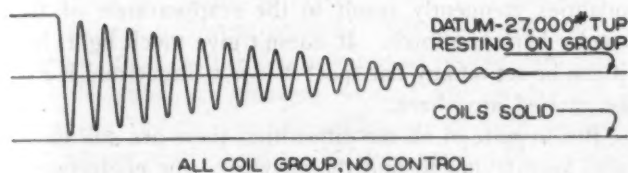
While the special test train is the ideal method of road

testing, it is not always possible to use it; so, if development is to continue, it is necessary to make use of regular freight or passenger runs. Since the summer of 1941, the facilities of the railroads have been so busy that special test trains have been out of the question, but some test work has been done from time to time.

A series of 53 test trips between Chicago and Elkhart, Ind., on the New York Central were made from June through October, 1942, in regularly scheduled freight trains with the cars attached just ahead of the caboose. Speed was limited to a maximum of 60 m. p. h. This series added another 8,500 miles of development. During the spring of 1943 and in the spring and fall of 1944, our service laboratory cars were utilized by two western railroads for three series of truck observation tests. These were made in regularly scheduled freight runs and in express and mail trains. In these latter series a maximum of 102 m. p. h. was reached, and the trains consistently operated over some parts of the run at sustained speeds around 85 m. p. h. Twenty-six of these high-speed round trips were run, totaling approximately 12,000 miles, and 16 of the freight trips, totaling 4,000 miles, were made.

During the summer of 1944 the service laboratory cars were used for performance testing and demonstration

DROP TEST



Comparative resonance of coil springs with and without control

between St. Paul, Minn., and Duluth, 160 miles, where 24 round trips in regular passenger trains and 10 freight trips were made, totaling another 10,500 miles. In the passenger trips the cars were coupled directly behind a Diesel locomotive and in the freight trains at the rear just ahead of the caboose.

This testing in a wide variety of services and under widely differing conditions for a total of over 50,000 closely observed and thoroughly charted miles, coupled with previous service and laboratory testing, has given us data and broad experience that could not possibly have been obtained in any other way. Our truck testing and allied developmental and research activity has cost the American Steel Foundries over \$500,000, and our management thinks it is money well spent.

Coil Springs Most Satisfactory

The modern freight car truck problem is no longer one of just side frame and bolster design, but now embraces a wider field, the major factor being that of providing a satisfactory spring-suspension system to afford easy riding under a wide variation in load and speed require-

ments. This involves all of the elements of the truck. We have long manufactured side frames, bolsters, snubbers, brake beams, and all types of railroad and commercial springs and the data accumulated in the continuous study of these various truck elements have been most beneficial in the present development work.

The spring-suspension system of a freight-car truck must have adequate capacity to carry the maximum permissible rail load, but it must also provide a satisfactory soft ride under light car or minimum load conditions. How difficult this task is can be appreciated when it is realized that each spring group of a 50-ton box car must carry from about 7,800 lb. for an empty car to a maximum of 40,000 lb. for a fully loaded car. Under these circumstances the riding qualities of a freight car at any particular load are necessarily a compromise.

Since the two principal factors in easy riding are long-travel springs and proper control of spring action, the combination of these constitutes the basic elements of the spring-suspension system. The A. A. R. tests and those we have made have established clearly that easy riding requires long-travel springs, properly controlled. They also established that no snubbing means with A. A. R. springs, with their short travel, can make them suitable for operation in modern speed ranges; but construction and operating dimensional restrictions establish limits beyond which it is not practical to go in freight-car truck spring travel. Without detailing all of the limiting factors, we believe that about 3-3/4 inch is the maximum total spring travel that can practically be employed.

Along with long total travel, a further requisite for modern speeds is adequate, reserve spring travel. This is the term applied to the amount of spring travel that remains after the car is loaded to its maximum rail load, and is important in the higher-speed ranges to cushion dynamic shocks. This is a characteristic of a modern freight-car truck; the reserve is now measured in the form of reserve spring travel rather than in its old form of reserve spring capacity.

The type of springs to be used for the modern truck is pretty nearly determined when the elements of weight and cost are taken into consideration. Nothing has been found more satisfactory for railway springs than the coil springs. That is being demonstrated in the new passenger-car trucks which are now built with practically 100 per cent coil springs. But, coil springs have a serious shortcoming which is technically known as resonance. This is the repeated bounce that takes place when a coil spring is subjected to an impact and which can be built up to violence if the impacts are repeated at the same intervals as the natural period of the spring. This takes place at what we call the critical speeds of particular spring groups. But, resonance, either at critical speeds or under the dynamic impulses at high speeds, can be controlled by introducing retardation or energy absorption into the spring suspension system. In passenger trucks this is done by hydraulic shock absorbers as a rule, and in freight car trucks we feel that mechanical friction offers the simplest and most economical method of control and have, therefore, incorporated it in our own truck development.

Over 50,000 carefully observed miles of performance testing have been run by the American Steel Foundries and some forty years of production, design and development experience have been accumulated. Combining these, we have evolved a modern freight car truck which we have designated the Ride Control Truck (A-3) which has demonstrated in test and in increasing numbers in active service its all-around suitability for all modern freight car services at any required load or speed.

EDITORIALS

A War By-Product

It is evident that the years immediately following the close of World War II will be a period of great activity in the development of railway motive power. If there were no other indications of this, it might be expected on the basis of the experience following World War I. Within the ten years after the end of that conflict appeared such innovations as the three-cylinder locomotive, the large firebox, the Type E superheater, and water-tube fireboxes of several designs. The application of roller bearings to locomotives also began during that period.

But that is by no means the only evidence of what may be expected after the close of the present war. Right now, in the midst of the war, a number of important developments in motive power are already undergoing service trials. Some of these, of course, were started before the war began, but other projects have been announced the engineering development of which is under way and the actual physical development of which will no doubt be started as soon as the nation's war job is completed. These involve completely new forms of motive power, including several applications of the steam turbine, with both mechanical and electrical transmission, and the gas turbine.

Little is being said concerning innovations in construction and machinery details, but many will be disclosed as the opportunity for their full exploitation presents itself. One innovation of this kind which will influence the future of the steam locomotive is the all-welded boiler which has already passed its period of experimental service with flying colors.

Lighting in Enginehouses

Just a few days ago, the author of this commentary was inspecting one of the most recently relighted enginehouses in the company of the designer of the installation. The open-type porcelain-enameled reflectors and the lamps were blackened to the point that they gave only a fraction of their initial output and the designer, having in mind some excellent lighting facilities he had installed at other places, said with an air of resignation, "You just can't light an enginehouse."

Judging by the great majority of installations (particularly in their present condition) the statement is completely accurate. A system such as that men-

tioned above looks nice when it is first put in and does a reasonably good job of lighting, but the first time someone spots a locomotive with the stack not under the jack, the lighting system suffers about a fifty per cent deterioration, and from then on it gets worse. No one cleans the reflectors, probably because they get dirty again so quickly. In fact everyone seems resigned to their poorly lighted surroundings; to have developed an apathy like that resulting from long-continued poverty.

Portable extension lights are usually furnished for local lighting, but these too fail to meet the lack of good general lighting. They are more or less fragile, their use is limited to the length of the cord and there is no place to hang them outside the running gear so that their use frequently entails one-handed work. These qualities frequently result in the reappearance of the smoky kerosene torch. It doesn't give much light, but it can be set on any flat spot; it is not fragile and it can be carried anywhere.

But in spite of all the difficulties, there are still those who keep trying to find the answer to the enginehouse lighting problem. One method which is described elsewhere in this issue appears to fill nearly all the requirements. One of its basic advantages is that it employs vapor-proof units which are less subject to corrosion and are much easier to clean than open reflectors. In some locations such units will breathe and take in a certain amount of moisture, but even with a drain hole, the reflectors will remain bright for long periods.

The use of four 500-watt units on each side of a locomotive will meet with objections from those who have been working with "marker lights," but the difference between stumbling in the dark and having good light is worth much more than the cost of almost any lighting system. Perhaps of greatest importance is the psychological effect of the light. More work is done, not only because men can see better, but also feel better. Dirt and debris gets cleaned up because it shows and since both men and management acquire pride in a good lighting system, the prospects of occasional cleaning are improved.

Just for good measure, the designers of the system described, tell of a kind of paint which has successfully inhibited corrosion of conduit and greatly prolonged its life in the corrosive enginehouse atmosphere.

It is too soon to say this is the best way to light an enginehouse (others for example are working with fluorescent lighting) but it appears to be one of the best methods available for use when the railroads again

have the opportunity to replace the many installations which have suffered from a naturally high depreciation rate during a long period when new materials were not available.

Responsibility For Cut Journals

An experienced railway car man, in commenting on the hot-box editorial in the March issue, called attention to a disturbing condition which he recently observed. While on a trip over western carriers he visited a private car line shop and noticed four completely rebuilt refrigerator cars turned out of shop with not a brass removed and the original packing used without any other attention than a little shaking up by hand.

In answer to a question, a general car foreman of the railroad on which the car shop is located acknowledged that he noticed the careless practice but said nothing could be done because of pressure brought by his traffic department to avoid any open criticism of the private car company involved. Our correspondent expressed the following opinion: "We are never going to get any place with these private line people until the A. A. R. rules are changed so that car owners are responsible for cut journals under any and all conditions, except where floods completely remove the lubrication."

The suggestion that cut journals be made an owner's responsibility has been advanced periodically for years and backed by men who, while possibly limited in number, possessed unquestioned knowledge, judgment and wide experience in railway car matters. The familiar expression "Where there's smoke there's some fire!" has a bearing in this case, and the mere fact that this suggestion keeps bobbing up indicates that it has some justification and probably some merit.

The principal argument against the suggestion is that improper servicing of journal boxes, rough handling, which causes waste grabs, and some other common causes of hot boxes are entirely under the control of the operating railroad which presumably should be willing to assume responsibility when trouble develops. The other side of the picture is that many hot boxes (sometimes estimated as high as 90 per cent) are due to deficient, non-A. A. R. standard mechanical conditions in the journal boxes and trucks as they are originally turned out of shop by the car owners. There is considerable reason to believe that, in all justice, these defects and the hot boxes which result from them should be owner's responsibility.

Many of the larger and more responsible private car companies are not subject to the criticism implied in this editorial; they have followed the policy for years of cooperating fully with individual railroads and the A. A. R. in endeavoring to keep their equipment up to

standards and any noticeable decline during the last two or three years has been due to necessarily intensive wartime use. Some of the smaller companies, however, either lack proper equipment and repair methods, or else are just plain careless in car-reconditioning work, with the result that cars just out of their shops make only a few miles before hot boxes or other troubles develop; the cars have to go to the repair track; trains are delayed, and needless expense is entailed.

Private car lines are not the only offenders in using inferior equipment and methods at certain car-repair shops and wheels shops. Some railroads also fail to provide adequate equipment and supervision for this important work, and here, again, the lack is usually more noticeable at smaller outlying points. There are undoubtedly many officers of private car lines and some railway officers who would not like to see any further development of this sentiment to make cut journals officially an owner's responsibility. When they have tightened up on present maintenance practices wherever they are deficient and have eliminated the indifference and carelessness which permit rebuilt cars to go out in service with dirty packing and possibly defective wedges and brasses they will have made the only effective contribution toward changing that sentiment.

Shop Layout Is An Engineering Job

There is a growing belief on the part of many railroad shop men that the time is rapidly approaching when most of our railway repair shops where the general overhauling of motive power is carried out are due for a general overhauling themselves; that they are poorly equipped and poorly arranged for the job that is ahead of them in the post-war period. Such an opinion is not hard to understand for, generally speaking, the railroads have not carried out any extensive programs of shop modernization for many years and the men who have been responsible for getting out the work, particularly during the war period, have in front of them every day the handicaps in production which have been accentuated by the pressure under which shops have been operating for many months past—handicaps resulting from the reluctance of management to spend in the pre-war period and from the inability to secure new equipment during the war period.

Satisfactory earnings and the availability of new machine tools and shop equipment are easing the situation and creating an atmosphere wherein shop management supervisors and officers are not only looking at the immediate future with awakened interest but with enthusiasm which is being reflected in the greatest volume of buying that we have seen in many years. Under such conditions it seems distinctly out of order to inject any sour notes and yet, if we are to believe what we are told by some individuals who have made

a lifetime study of this problem, the railroads, in buying several millions of dollars worth of new equipment for repair shops, may very easily perpetuate errors that have been made in the past and fail to derive from the new equipment the economies that they have a right to expect from its installation.

It may be well to state, as a principle, that pieces of shop equipment viewed as individual units are merely tools which when arranged and utilized in proper combinations are capable of performing a production job which presumably has been planned beforehand. It stands to reason, then, that before one can buy shop tools intelligently the character of the over all job must be clearly in mind and the plans for doing that job have been developed.

A recently published book, "Industrial Management" states, in discussing plant management the fact that no two industrial plants are exactly alike; that physical arrangements will therefore differ but that all require the application of common principles, the objectives of which are: economies in handling; lower costs of useful areas; minimizing of production delays; avoidance of bottlenecks; better production control and supervision; avoidance of unnecessary and costly changes once a layout is made; improvements in production processes and methods; provision of a layout that permits meeting of competitive costs; and incorporation of safety into the physical plant as a part of the layout and organization. These are fundamental principles that apply just as surely to a railroad repair shop as they do to any large industrial production plant. They might be said to constitute a check list that should be gone over in relation to every change that is made in the shop.

Fortunately we are approaching the matter of Diesel locomotive repair shops in the right way—right in that we have accepted as a matter of principle the building of new shops instead of attempting to adapt steam locomotive repair plants to Diesel repair work. The great difference in the nature of the work demands that this be done in the interest of economy.

In the matter of steam-locomotive repair shops there is one word of caution and one important fact that is worth mentioning and that is that practically without exception our existing shops were designed, built and arranged many years ago and as far as layout is concerned remain practically unchanged, while the steam locomotive of today is no more like the locomotive of 20 or 25 years ago than night is like day. How, then, can new machine tools be purchased and dropped into place in a shop layout 20 years old and maximum economies be expected?

Another point that is important is the fact that most shops have far too many machine tools for no better reason than that, when the shop was originally built, many more locomotives were going through the shop; locomotive parts did not have the service life that they now have and the machines themselves did not have the productive capacity that present-day machines have. How, then, can any railroad justify the continuation of

a shop layout and a shop inventory of equipment that may be entirely unsuited to the needs of today and the days to come?

There is only one solution to the intelligent spending of the shop-equipment dollar. We have in mind, at this writing, a railroad that is planning to spend a total of three million dollars for new shop equipment and yet that road has no shop engineering department the function of which and the responsibility of which is the assurance that that railroad gets its money's worth out of what it is going to spend. Machine-tool builders who are familiar with railroad work criticize because railroads will sometimes spend from 10 to 20 thousand dollars for a new machine and then, in a false idea of economy, refuse to spend a few hundred dollars for tooling and handling equipment that are absolutely necessary for obtaining maximum production from the new machine. A thorough study of the relation of machining time to floor-to-floor time in many shop departments would reveal such a total lack of good shop engineering as to be amazing.

The next few years will be a vital period in railroad shop rehabilitation and if the roads are going to spend millions without the benefit of good engineering planning they may as well spend the money in other directions. No railroad of any size can afford to be without a shop engineering department.

NEW BOOKS

PLASTICS CATALOG—1945. Published by Plastics Catalogue Corporation, 122 East 42nd St., New York 17.

1178 pages, 8 in. by 11¼ in., illustrated. Price \$6.00. This is the annual edition of a catalog of an industry which is growing so rapidly that annual revisions of material concerning it are required. It contains basic information concerning plastic materials and products and their manufacture and fabrication. Extensive charts and tabular information provide quick-reference data of individual characteristics and comparative qualities.

New material in this edition includes information on recently developed plastics, including silicones. There are also new articles on engineering designs employing plastics and on the making of plastic models. The section on laminates, plywood and vulcanized fibre has been thoroughly revised as has been the chapter on synthetic rubbers and rubber-like plastics. Synthetic fibres and coatings are dealt with at length and there is a new article on organic coatings for metals.

A directory section includes ten complete directories to all branches of the plastics industry including educational institutions, molders, material manufacturers, trade names, etc. A glossary of terminology serves to acquaint the reader with terms and definitions which are peculiar to the industry.

THE READER'S PAGE

Some Car Oils Are Not Too Good

TO THE EDITOR:

We have read a great deal and heard so much about the prevention of hot boxes that one wonders sometimes what more can be done to minimize such heating failures. The fact remains, however, that in spite of all the cure-alls publicized we are not getting the results that we are all seeking.

In the summer months when hot boxes increase, we hear the cry that it is because of extremely hot weather, whereas in the winter the trouble is ascribed to the oil congealing and the packing freezing to such an extent that the rolling mass can not be treated in transportation yards. Consequently, many cars are set out enroute and occasionally a journal will burn or break off, sometimes with resultant heavy property damage. These failures are expensive and cause embarrassing delays.

Various experiments have been made to prevent waste grabs. Many railroads have been employing special devices in journal boxes and using different designs of journal bearings to that end. Despite all these experiments, I question whether we are making the right approach in solving our hot-box problems.

The matter has caused me much concern and upon exploring the situation on this railroad I have come to the conclusion that in a great many cases the cause of overheated journals can be directly traced to the quality of oil used by many railroads. It, therefore, would be my recommendation that railroads concentrate on this phase of lubrication, namely, obtaining a better grade of oil. Investigation, I think, will confirm my understanding that many railroads are buying oil in tank-car lots that is costing them little more per gallon than the oils commonly used for domestic purposes.

We should endeavor to get an oil that will give superior performance under varying temperatures. Of course, the effort must be universal and there must be uniformity of practice. Once we get the right grade of oil, there must be strict adherence to Rule 66 if the results sought are to be achieved. I am convinced of the fact that the cost of the oil should be of secondary consideration. If a good grade of oil will prevent waste grabs in severe hot weather and the rolling of waste in extreme cold weather, thus reducing heating failures, the increased price per gallon will be more than offset by the minimization of expensive failures to say nothing of the benefits derived from improved train operations.

The development of better lubricating oils for car journals to my mind presents a fertile field for thought and decisive action. I don't think it too much to hope for—witness the performance of the highly refined oils in airplanes and automobiles under extreme varying temperatures. While it is recognized that such oils are not adaptable to railway car lubrication, their development does suggest that oil companies through research could improve the film strength and other properties of car oils and offer a product that will insure better lubrication at extreme summer and winter temperatures.

Of course, a better grade of lubricating oil will not in itself prevent hot boxes if the boxes are improperly serv-

iced and the mechanical parts neglected. For example, it has come to my attention that some railroads are rebrassing overheated journals notwithstanding the fact that they are discolored and require attention. It seems that some car department supervisors take the position that a journal must be cut to warrant its removal from service. When a train crew finds it necessary to set out a car for a hot box the damage has been done and the wheels should be changed. The practice of rebrassing the journal and repacking the box and permitting the car to go forward should be discouraged. Instead, the car should be carded to the nearest available repair point for change of wheels.

The importance of this is emphasized by the conditions found in our wheel shop. In the reconditioning of journals, a large number of journals that have run hot in service are found with thermal checks and cracks. Such axles are unfit for service and are scrapped. Obviously, the simple expedient of rebrassing cars that have been set out for a hot box constitutes a menace to efficient train operation and the practice should not be countenanced. We should be especially vigilant to prevent so far as is humanly possible delays in traffic, resultant property damage and possible injury to train personnel.

It is a well known fact that instances have occurred where axle failures have been traced to the absorption of non-ferrous metals into the steel journals. In a recent article on this subject, it was pointed out that at a temperature of about 480 deg. F. or more, the steel journal begins absorbing the brass metal, and when the journal is overheated a second time, cracks develop from the surface inwards.

It seems to me that this emphasizes my thought that it will repay us to give overheated journals the utmost attention in wheel shops to insure their suitability for service before they are again used.

In conclusion it is my thought that if this problem of oil were presented to the oil companies and a study undertaken in cooperation with the Association of American Railroads, a grade of oil could be produced that would function more efficiently in extreme weather.

G. W. DITMORE, *Superintendent Car Equipment D. & H.*

* * *



Courtesy Westinghouse Electric & Manufacturing Company.

Tender-tank repairs by arc welding

IN THE BACK SHOP AND ENGINEHOUSE

Material Delivery At C. & N. W. Shops

Among other important improvements already completed or in prospect for the Chicago shops of the Chicago & North Western is a completely revised and modernized method of handling small materials from the storehouse to the shops and between the various shops and departments. This material movement constitutes in itself a major operation and can be minimized only by organized procedure and the use of adequate power truck and trailer equipment. With approximately 535 mechanics employed at the C. & N. W. locomotive shops, the inter-department movement of materials was formerly handled by means of 35 push carts, 30 hand trucks and 52 push-cars. After stripping locomotives, the parts were placed on the push-cars, rolled onto the transfer table, moved to the lye vat and each part taken off separately and placed in the lye vat. Subsequent movement to the various departments for repairs and back to the locomotive

S-1 to the driving wheel shop, stripping and wheeling shop, machine and erecting shop, and return. The second route connects S-1 with the Diesel train ramp, light machine shop, boiler shop, tank shop, wheel shop, blacksmith shop, and return.

Chore Boy 1 makes the first route, consisting of one round trip each hour from S-1 to Box 1 in the driving wheel shop M-49, then to Box 2 in the stripping and wheeling shop, Box 3 in the finishing shed, M-50-A, Boxes 4, 5, 6, 7, 8 and 9 in shop M-50, and thence back to the storehouse so that orders picked up on this route may be left and materials secured on requisitions delivered to the stores department on the previous trip. This Chore Boy ties up for the night at Box 7 and starts the first trip at 7:30 a. m. the next morning, picking up orders from the various boxes for delivery to S-1, then loading material which has been put up by the stores department employees on requisitions left the night before and delivering it promptly to the respective shops.

Chore Boy 2 starts from Box 10 located at the Diesel



Tractor and driving-wheel trailer outside the wheel shop—New lye vat and gantry crane in the background

tive for assembly was largely handled in a similar manner, in some instances using mechanics as well as helpers to move the push carts and hand trucks.

To avoid using high-price help, badly needed elsewhere, for moving locomotive shop materials, a schedule of hourly deliveries of material has been set up and the following equipment has been installed, or will be in the near future: two Chore Boys, one 10-ton gas-electric lift truck; one three-ton gas-electric crane truck; one three-ton gas-electric lift truck, with 50 skid platforms; two three-ton gas-electric high-low lift trucks. This new equipment is being used in conjunction with a number of units of older power trucks which are still serviceable.

The individual shop buildings with their respective letter designations and the various material delivery stations or boxes for picking up orders and leaving materials are shown in the accompanying drawing and table. In general, two separate routes are followed, one consisting of a loop from the small materials store house

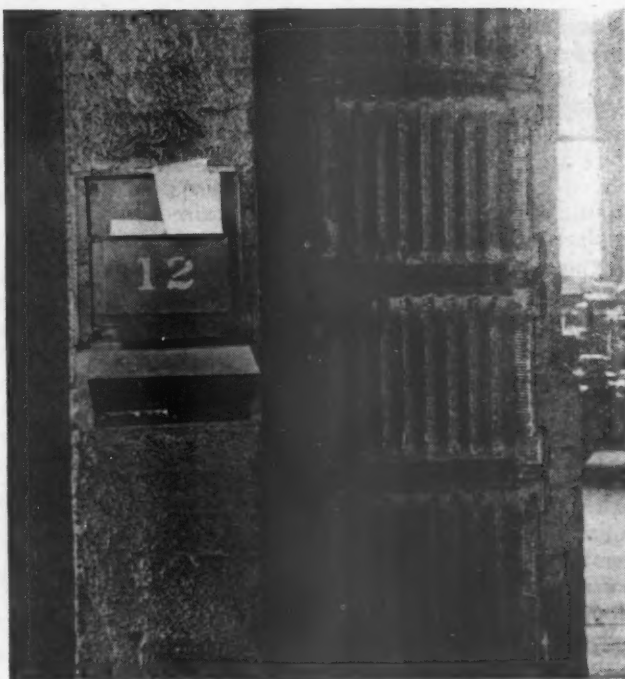


Chore Boy 1 delivering miscellaneous material in the machine and erecting shop

train ramp at 7:30 a. m., picks up orders at Boxes 11, 12, 13, 14 and 15 in building M-1; Boxes 16, 17 and 18 in building M-6; Boxes 19, 20, 21 in M-14; Box 22 in M-15 and Box 23 in shop M-16, and delivers these orders to building S-1 to be filled by the stores department forces. Materials supplied on orders from the previous trip are picked up and distributed, as required to Boxes 10 to 23, inclusive, the Chore Boy making a complete round trip once each hour.

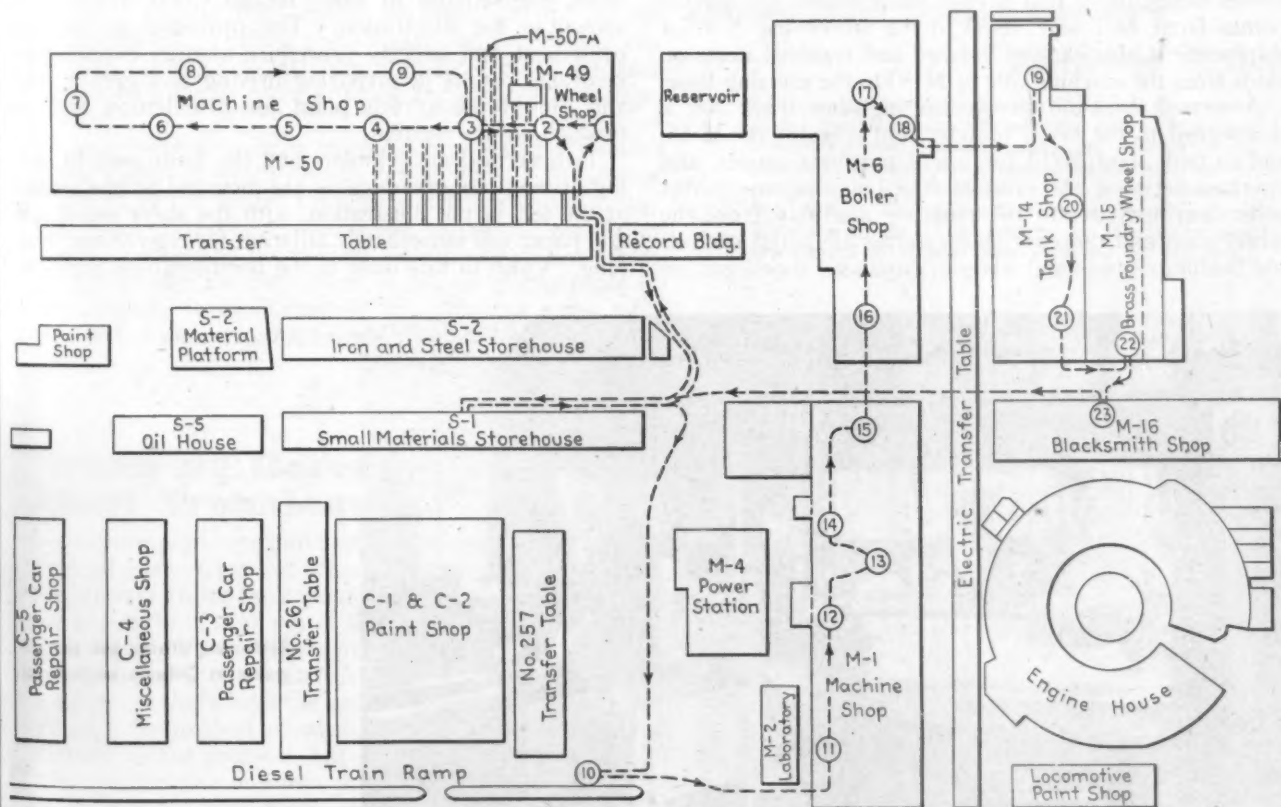
One 10-ton gas-electric elevated-platform truck No. 3 is assigned to the wheeling and stripping shop. This lift truck is used exclusively for handling driving wheels from the stripping pit to the lye vat, and from the lye vat to the storage tracks; also from storage to wheel shop M-49 and from M-49 back to the wheeling shop, ready to be placed under the locomotives with the boxes and cellars in place; also wheels from storage to the stores department for shipment to outside points. The former method of handling wheels was by manual rolling. With the use of the high-low truck, mechanics and helpers can be kept on the job utilizing their talents where they are so badly needed. Also, in the past it was customary to use machinist helpers to scrape and clean the wheels. With this lift truck, the wheels are picked up and moved to the lye vat where the cleaning is done much more quickly, thoroughly and without hand labor.

A three-ton gas-electric crane No. 4 is assigned to M-50 and blacksmith shop M-16. It is necessary to move crank pins and other heavy castings such as crossheads, cylinder heads, valve heads; etc., from the stores department to the machine shop. Formerly men were sent to the stock piles to lift this material out and load it onto trailer push wagons and trucks by manual labor. The



Typical material delivery station—Box 12 in the machine shop

power crane truck now handles all such items on material-move orders and instructions from the material supervisor, and also handles heavy items to and from the various departments and repair points throughout shop M-50 and the stripping department which cannot



- Box 1—Driving-wheel shop, M-49
Box 2—Stripping and wheeling shop, M-49
Box 3—Finishing and firing-up shed, M-50-A
Boxes 4, 5, 6, 7, 8 and 9—Machine and erecting shop, M-50
Box 10—Diesel-train ramp

Small materials storehouse, S-1

- Boxes 11, 12, 13, 14 and 15—Machine shop, M-1
Boxes 16, 17 and 18—Boiler shop, M-6
Boxes 19, 20 and 21—Tank shop, M-14
Box 22—Brass foundry and wheel shop, M-15
Box 23—Blacksmith shop, M-16

Shop locations and material delivery stations or boxes at the Chicago shops of the C. & N. W.

be handled by the lift trucks, such as driving rods, stoker screws, pistons, reverse shafts, etc.

A three-ton capacity gas-electric lift truck No. 5, together with fifty Style 1 steel lift truck skid platforms, are assigned to the blacksmith shop M-16. As locomotives are stripped, spring rigging and brake rigging are placed in the steel skid boxes and moved to the blacksmith shop for repairs. After it is repaired, this material is placed back in the skid boxes and moved to the spring-rigging department where it is assembled ready to be placed on the locomotives. It is then moved from the spring-rigging department to the locomotive by one of the lift trucks assigned to M-50. All other forgings in the blacksmith shop are placed in skid boxes and moved by this lift truck instead of being moved on push carts and hand trucks by manual labor.

The electric-battery lift-truck formerly assigned to the blacksmith shop was inadequate because of its being a battery-operated machine which could not leave the blacksmith shop over the rough roadway and was not always available for service owing to the frequent necessity of putting it on the charging line. This battery lift truck, along with the necessary skid boxes for interdepartment moves, has been assigned to shop M-1 and boiler shop M-6.

A three-ton gas-electric high-low truck No. 6, along with the necessary skid boxes, is assigned to shop M-50 for movement of material between shop M-1 and M-50 and the stripping shed. A great number of castings are machined in shop M-1 such as bull rings, crossheads, crosshead shoes, back valve heads, driving boxes, cylinder heads, etc., for locomotives undergoing repairs. These items are placed on skids and moved by this power truck in place of hand trucks and push carts. The truck also moves heavy items that are on shop orders for outside points from M-1 and M-50 to the storehouse S-3 for shipment. It also handles finished and repaired items on skids from the machine side of M-50 to the erecting floor.

A second three-ton gas-electric high-low truck No. 7 is assigned to the brass foundry and wheel shop M-15, and to tank shop M-14 for interdepartment moves, and operates between M-1 and M-50. This machine moves roller-bearing parts to the point of assembly from the wheel shop and the tank shop; moves all brass, such as rod bushings, shoes and wedges, crosshead shoes, etc., in

skid boxes to M-1 and M-50; and returns from M-1 and M-50 to the brass foundry with scrap brass and shavings which are placed in skid boxes at stations throughout M-1 and M-50. It also handles heavy items of material from the stores department to M-14 and M-15.

One large crane truck, which cannot be used in any shop buildings because of its size, is now used exclusively for unloading and loading of wheels at the tank wheel shop from wheel cars for shipment to outside points.

There are also two large-bed lift trucks for extra heavy parts. Special skids have been made for one truck which is assigned to the stripping pits in M-50-A. All material, such as motion work, crossheads, pistons, casings, spring and brake rigging, boiler mountings, air equipment, driving boxes, etc., are moved from the locomotives in skid boxes and this truck works between M-50-A and the lye vat and is used for delivering material from the lye vat to the various departments in M-50. The other lift truck is assigned to the lower end of M-50 for handling boosters, stokers, etc., and other heavy items on the erecting floor.

One International tractor is used for hauling trailers loaded with bar stock from the iron racks to the blacksmith shop and machine shop; front ends and ashpans from M-50 to M-6; wheel centers from the stores department to M-1 and from M-1 to M-49, and other heavy items of material.

Grease Reclamation

One corner of the grease reclamation room at the Oelwein, Iowa, enginehouse of the Chicago Great Western, is shown in the illustration. The provision of adequate equipment and orderly procedure assures exceptionally favorable results in preparing driving box grease, cakes and pin grease at this point for distribution and use throughout the system.

Two vertical air cylinders and the form used in making driving-box grease cakes are mounted on the channel at the left in the illustration, with the sheet metal table and paper roll immediately adjacent for convenient wrapping. Close to this table is the horizontal air press and



Reclaiming driving box and pin grease at Oelwein enginehouse

die used in forming pin grease which comes through the die in long strings, is cut off and drops to the sheet-metal pan from which it can be packed in light wood boxes.

The mandrel, shown at the extreme right in the illustration, is made of a scrap driving axle turned down in five sections for use in straightening the various sizes of perforated driving box cellar plates. These sizes include 9 in. by 12 in.; 10 in. by 12 in.; 10½ in. by 12 in.; 11 in. by 14 in.; and 13 in. by 14 in.

Old driving-box grease cakes shipped to Oelwein from all points on the system are reclaimed by trimming off the dirty grease and using the remaining clean grease for reworking into grease cakes and pin grease. All grease, both new and to be reclaimed, is stored in easily accessible steam-heated lockers so it will be sufficiently pliable to permit being formed or forced through the dies without the use of excessive pressures in the 18-in. air cylinder for the grease-cake press and the 14-in. air cylinder for the pin-grease die.

Perforated plates removed from the incoming grease cellars are cleaned in the lye vat and straightened on the five section mandrel ready for re-use. In order to assure a thin layer of grease between the perforated plates and the main journals of newly packed driving-box cellars, a priming plate is placed in the bottom of the grease-cake press and the perforated plate on top of that. The sides of the press are brushed with water to prevent sticking; about one-quarter of a cake of new grease is applied in the press, with a canvas square on top to prevent sticking to the follower plate; air pressure is applied in the 18-in. cylinder which forces the follower plate into the press and forms the grease cake; the follower plate is withdrawn; a smaller air cylinder under the table pushes the grease cake up out of the press; the priming plate is pulled off leaving a regular thin pattern of grease on top of the perforated plate; excess grease squeezed out during the pressing operation is cut away; and the grease cake with perforated plate in place is ready for packing and shipment.

The pin-grease forming machine also consists of double-acting cylinders which operate horizontally. The grease is placed in the nearer cylinder which has a die drilled with holes of the proper size at one end and a close-fitting piston, operated by the tandem air cylinder, which forces grease through the die. Most of the pin grease made in this machine is ¾ in. and ⅞ in., although some 1-in. grease sticks are required for old style rod grease cups.

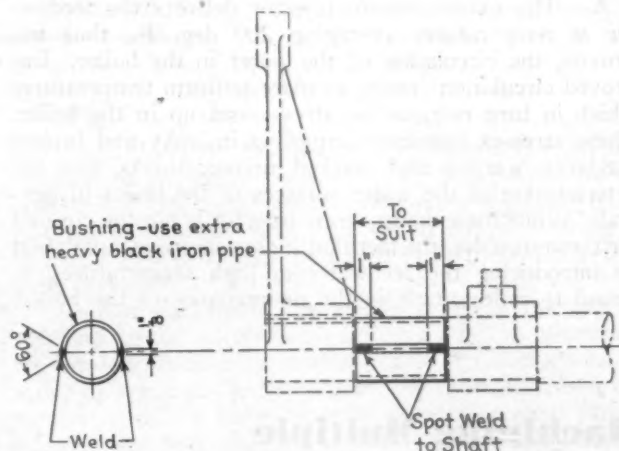
Renewing Reverse-Shaft Trunnions

Some roads that have purchased large steam power within the past year or two have found that the first time these locomotives come through the shop for general repairs the trunnions of the reverse shaft are worn out of round and must be turned. There are instances where a shop is not equipped with a lathe of sufficient capacity to swing the reverse shaft with the arms attached. Where this is the case the method shown in the drawing is a possible solution of the problem, but one of two things must be done. Either the bushings must be applied to the shaft before it is too badly worn, in which case the bore of the reverse shaft bearings must be increased, or the arms must be removed from the shaft and the trunnions turned down to take the bushings.

The application of the bushings is a simple process. They can be made from pipe, bored and turned to fit.

They are then split and clamped to the shaft, welded as shown, and the weld filed down to a smooth surface.

The method shown is used at the Beech Grove, Ind., shop of the New York Central. At this shop, which has



The application of the bushing and the welding method is clearly shown by this drawing

lathes of large capacity, the trunnions are first turned and a bushing is applied of such outside diameter as will suit the present bore of the reverse shaft bearings.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Water Level Determination

Q.—When determining the water level of a locomotive, it is our practice to obtain the height of the crown sheet by the use of a hose and two water glasses filled with water. One glass is placed against the under side of the crown sheet, the hose is passed through the firedoor hole and the other glass laid against the backhead and slowly raised until water runs out of the glass against the crown. The level of the water in the glass against the backhead determines the height of the crown sheet. This is done after the engine has been leveled both longitudinally and crosswise. The question has been raised as to the accuracy of this method, especially with regard to the possibility of air bubbles being pocketed in the hose. Can an air pocket in the hose be detected?—F. I. K.

A.—Air pockets in the hose can be detected by filling the hose with water, bringing the glass tubes side by side and observing the water level. If it is not the same in both tubes there is an air bubble or other obstruction in the hose. In preparing a hose for this purpose, run water through the hose for a short time until you know the hose is wet all the way through. Then fill it and keep pouring a little water into one end, running the water out at the other end. Work the hose a little and then make the test.

Use of Exhaust-Steam Injectors

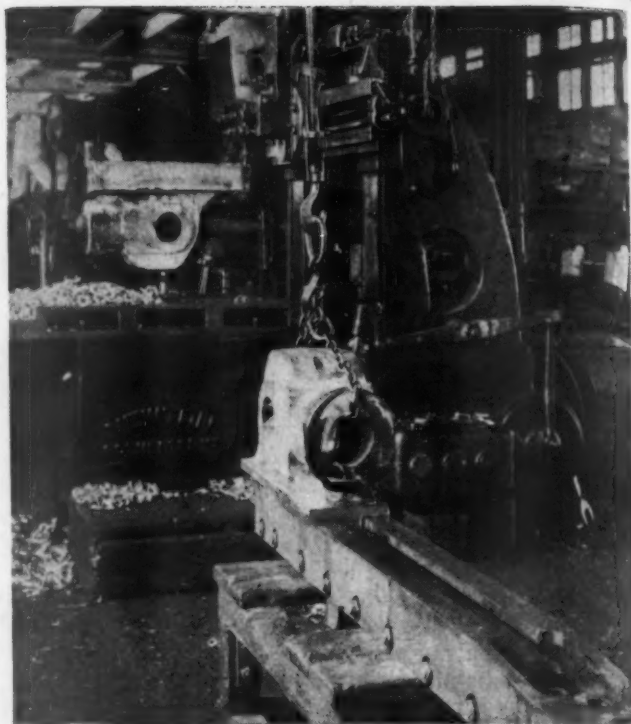
Q.—What advantages has the use of an exhaust-steam injector in place of the live-steam injector with respect to boiler maintenance?—M. I. R.

A.—The exhaust-steam injector delivers the feedwater at temperatures averaging 200 deg. F., thus improving the circulation of the water in the boiler. Improved circulation results in more uniform temperatures which in turn reduces the stresses set up in the boiler. These stresses manifest themselves in leaky and broken staybolts, warped and cracked firebox sheets, and the deterioration of the water surfaces of the boiler in general. While the exhaust-steam injector is not the cure-all for these troubles, the fact that it does improve circulation by introducing the feedwater at high temperatures, is bound to reflect itself in the maintenance of the boiler.

Machining Multiple Bearing Crossheads

Heavy repair work on Chicago Great Western locomotives is done at the back shop, Oelwein, Iowa, but the enginehouse at that point is equipped to make Class 5 repairs. As practiced on this railroad, these constitute thorough overhauling of all the wheels, driving boxes and motion work. A new Bullard 42-in. vertical turret lathe recently installed in the Oelwein enginehouse greatly facilitates this work especially when equipped with necessary holding jigs and fixtures for some of the awkward locomotive parts which have to be machined.

New crossheads, for example, are generally finished at



Multiple-bearing crosshead being machined on crank planer and fitted to the guide

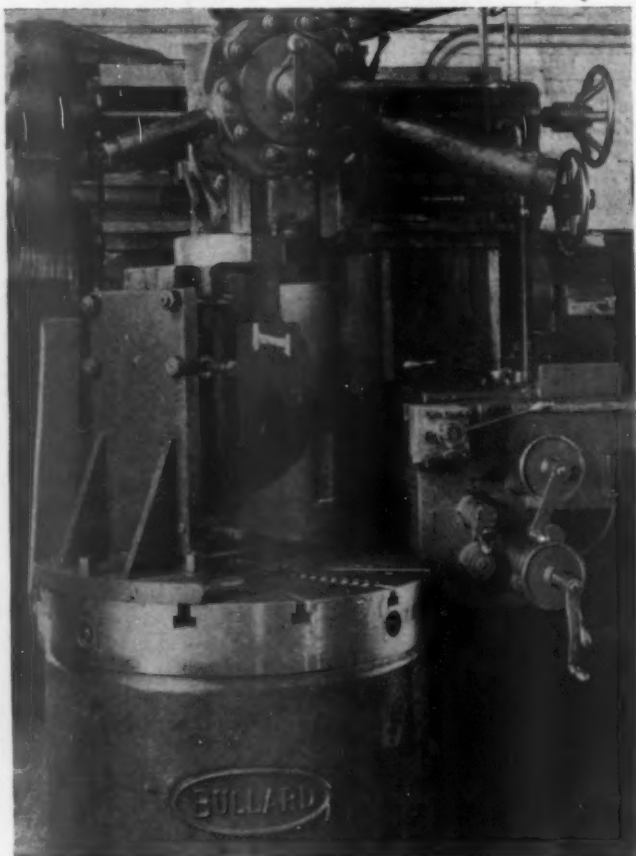
the Oelwein back shops, but if it is necessary to renew a piston rod for any reason at the Oelwein enginehouse, this involves reboring the taper fit in the crosshead. Particularly in the case of underhung multiple-bearing crossheads, it is not easy to set the crosshead up accurately on the boring machine table and at the same time rigidly enough so that a smooth cut can be taken.

To facilitate this work a special jig has been built which is in reality an angle bracket made of 2-in. steel plate, with a base 24 in. long by 10 in. wide at the widest point of the curved outer side. The vertical plate 14 in. wide by 29 in. long is welded to the base plate, being set accurately at an angle of 90 deg. to the base and stiffened in that position with two 1-in. angle brackets as shown in the illustration. The jig is fabricated by electric welding and drilled for holding bolts.

It is obvious that a crosshead bolted to this fixture will have the center line of the piston bore accurately vertical in one plane and can be easily adjusted to be vertical in a 90 deg. plane by means of the holding bolts. Slots in the base of the jig permit adjustment on the machine table so that the center line of the piston-rod bore can be easily adjusted to coincide with the center line of the machine table.

The particular job illustrated consists of facing the boss with a small round-nose tool supported in one of the turret tool holders. The boss is also turned with the cutting tool held horizontally in the same turret head. For boring the piston-rod fit, the short boring bar is used, the head of the machine being set to a taper of $\frac{3}{4}$ in. per foot. The table speed is set for 23 r.p.m., and the roughing feed is .245 in. per revolution. For finishing, this feed is reduced to .083 in.

On a crosshead of the size illustrated, designed for use on the 2-10-4 type locomotives of the Chicago Great Western, about $3\frac{1}{2}$ hrs. are required for boring the piston rod fit, one-half of this time being setup time. The accuracy of the fit and smoothness of the bore is such that subsequent grinding or lapping of the piston rod end in the crosshead is not required.



Bullard 42-in. vertical turret lathe machining crosshead at Oelwein enginehouse

With the Car Foremen and Inspectors

The Mechanical Handling of Car Material*

By J. T. Crake†

The purpose of this paper is to set forth what can be done in the efficient handling of car material at a small car shop or rip track by the use of several devices which have proved of material assistance.

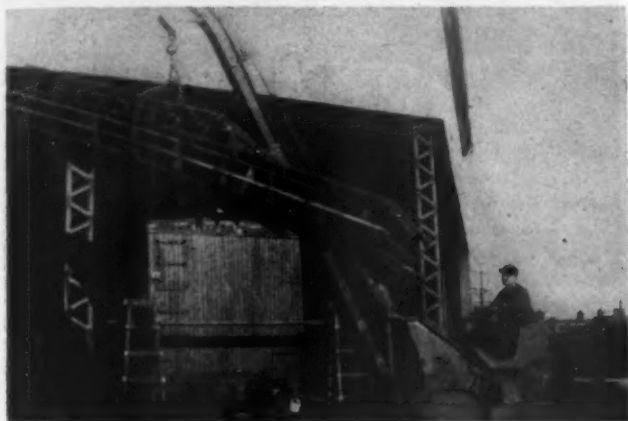
At larger shops, the railroads do not hesitate to install all modern devices, which they no doubt find economical. However, the trend of opinion among railroad officers

one time, it took several men to move the trucks from one machine to another. By the use of a hydraulic hand-operated lift truck, one man can now move this stock from machine to machine with little or no effort, whereas it formerly took from three to four men to perform this same operation.

We have also found the mobile cranes invaluable in speeding up the delivery of material, as well as lightening the burden of handling various kinds of material in our shop, rip track and material yard. We formerly used six men in unloading heavy timbers, such as sills and plates, and this was dangerous work. With the mobile crane and three men we now unload six sills at one time. The same condition exists in the delivery of these sills from the stock pile to the wood mill. It formerly required six men to carry one of these sills to the mill, whereas with the mobile crane the operator and one man deliver six sills at a time.

The use of these mobile cranes in the handling and loading of scrap iron has also proved economical. We load all scrap in one-trip steel drums, storing the scrap in these drums, and when the scrap is loaded we merely lift these drums into the car and dump the contents. By this method, we load from 300 to 800 lb. on each lift.

We also find the mobile crane invaluable in cleaning the shop. As a refrigerator line, we have a large accumulation of scrap paper, felt and small pieces of wood, all of



Handling heavy floor racks by mobile crane

seems to be that the volume of material handled in the smaller shops or on rip tracks does not justify a large expenditure for any material-handling devices. This I believe is an error. However, it is necessary for the individual car foreman to convince the management of the efficiency of the various devices available.

We found that the use of a simple roller conveyor for unloading lumber not only has reduced unloading costs considerably, but has lightened manual labor by eliminating the carrying of heavy items, such as large oak timbers, etc.

These roller conveyors are efficient in the unloading of tongue-and-groove lining, 16 and 18 ft. long, as they can be spotted so that the material is rolled right on the pile, eliminating quite a bit of walking which, in turn, reduces the unloading time. We have computed that the unloading of one carload of 18-ft. lining by the old hand method required each man to walk approximately seven miles, during which walk it was necessary to carry approximately 90 lb. on his shoulder. The use of this roller conveyor eliminates practically all of this walking and carrying.

In the wood mill, we found it expensive to handle lumber from one machine to another on the old-style trucks, particularly heavy items, such as large oak and other timbers. If any appreciable amount was run at



The crane lifts six heavy timbers at one time

* Abstract of a paper presented before the January 16 meeting of the Car Department Association of St. Louis.

† The author is labor gang leader of the St. Louis Refrigerator Car Company.

which is light but difficult to handle and dispose of. Our present method is to use scrap boxes about 5 ft. wide and 9 ft. long, which are set at strategic points throughout the shop. The boxes are filled with the rubbish as it is taken from around the cars. The mobile crane then picks the box up by the use of chains hooked in the four corners of the box. The crane operator takes the box to the rubbish car, where two chains are disconnected and the boom raised, permitting the contents to fall into the rubbish car. This is all performed by the crane operator without any assistance.

Truck Work Facilitated by Mobile Cranes

We also find these mobile cranes assist us materially in setting up trucks, handling mounted wheels, and loading and unloading of unmounted wheels. I might add that these items all are heavy and the burden on the men is lightened considerably. It is possible to set up an entire truck without the men doing any lifting whatever, as all parts are lifted into position by the crane boom.

We also use the mobile crane for moving cars to the exact location desired, and for the delivery of all heavy material directly to the car.

The original cost of some of these devices may appear to be large. However, when consideration is given to their many uses it is obvious that they are economical. We have computed that the cost of operating one of these machines, including depreciation and repairs, is about equal to the wages of one laborer. It is obvious that they can do more work than one man. In fact, it has been our experience that they are capable of performing the work of several men.

We also found the use of these mobile cranes eliminated quite a number of accidents, especially mashed and broken fingers and toes. The savings realized by the prevention of accidents assists materially in defraying the expense of one of these machines. This is also true of other material handling devices.

The devices mentioned are only a few that are available and no doubt each car shop has similar operations which can be handled more efficiently by the use of some mechanical aid, thus reducing accidents and eliminating a lot of hard work, as well as reducing handling costs and increasing output per man.

Cleaning Car Carpets

The illustrations show the operation of cleaning a dining-car carpet preparatory to replacing it in a diner at the 47th Street, Chicago, coach shops of the Chicago, Rock Island & Pacific. The cleaning platform is a wooden structure about 24 in. high by 11 ft. wide and 60 ft. long. In accordance with usual practice, air is piped from the shop line to a point about midway along one side of the platform. The air pressure varies somewhat, but is usually about 70 lb., air being conducted to the 4-ft. pipe section with expanded nozzle, held by the operator, through a rubber hose of suitable length.

All car-servicing operations are subject to change under present arduous conditions in railway coach shops, but, in general, carpets of Rock Island cars are given three classes of cleaning: once a week, the carpets are removed and thoroughly blown on the platform illustrated; approximately twice a year the carpets are not only blown but given a light surface cleaning; when cars are received at the shops for general repairs, the carpets are

blown and thoroughly washed and renovated before being returned to the cars.

For the weekly blowing operation, all dust and dirt in the carpet is thoroughly loosened by inserting the air pipe between the carpet and the platform and working the air jet back and forth under the carpet, first on one side of the platform and then on the other. Any loose dirt remaining on top of the carpet is then removed by light blowing from the top as shown in one of the illustrations. This job usually requires about two hours, or two men can do the work in one hour.

For the semi-annual cleaning, the carpet is first blown as described. The carpet is then gone over carefully to remove all gum and grease spots using a combination of benzene and ether in the proportion of four or five ounces of ether to a gallon of benzene. The benzene loosens the gum which can be removed by scraping and the ether



Blowing and light washing a dining-car carpet at the Chicago coach shops of the C. R. I. & P.

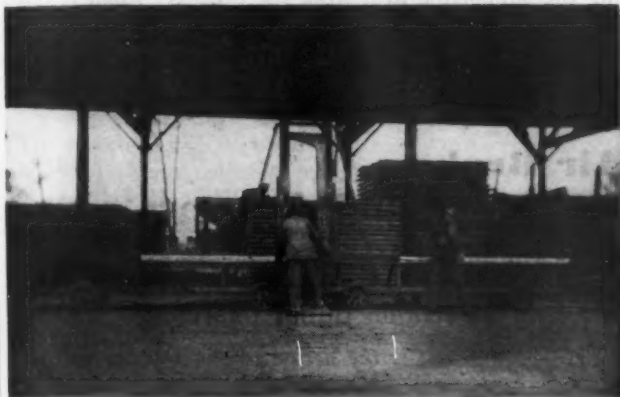
dries up grease spots which would otherwise be left. A special carpet-cleaning solution, developed on the Rock Island, is applied with a sponge and quickly brushed off to clean the surface nap without wetting the main weave or warp. This operation takes one man four hours or can be speeded up in proportion by using two men.

For major cleaning when the cars are taken into the shop for general repairs, the carpet is blown and gum and grease spots removed on the carpet blowing platform illustrated. The carpet is then taken to the upholstery department in the shop, stretched to the required standard length and tacked to the floor, ready for thorough washing which involves wetting the carpet all the way through, including the warp, and which would cause shrinkage without tacking the carpet to the floor. For this heavy washing, a solution of $\frac{1}{4}$ lb. of borax added to 24 bars of ivory soap cut in flake size is used and the mixture boiled until dissolved. The solution then stands until it becomes a heavy jelly.

This jelly is scrubbed on the carpet with a brush and scraped off with a 6-in. by 12-in. sheet metal squeegee, the operation being repeated as many times as necessary to clean the carpet which is then sponged and scraped until all traces of soap are removed. The carpet is allowed to dry thoroughly in its stretched position and is then brushed with a stiff rice brush which raises the nap and produces a uniform color. The carpet is then ready for reapplication in the car. A half section of dining car carpet, 9 ft. wide by 30 ft. long, can be scrubbed in approximately 2½ hr. by this method. The function of the soap in the scrubbing solution is, of course, to wash the nap and warp thoroughly and the borax is used to restore the sheen to the fabric. No attempt is made to dye carpets which become faded as this would destroy the pattern.

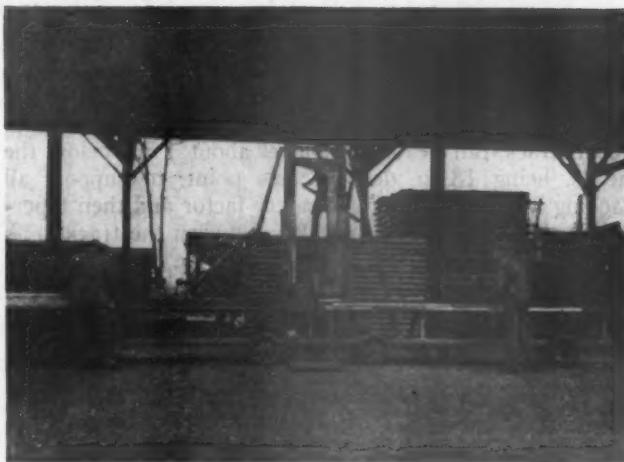
Sawing Lumber At the Storage Pile

Storage sheds for freight-car flooring at the Birmingham car shop of the Southern are located adjacent to the working tracks but at a distance of approximately 1,000 ft.



A length of flooring being sawed as the helper prepares to feed another length to the operator

from the planing mill. It was formerly necessary, when flooring was to be cut to length, to load shop trailers with flooring, move it to the planing mill, saw and reload the flooring on the trailers and move the trailers to the work track. The handling involved in preparing a load of floor-



The feeder is receiving floor plank from the man on the storage pile —The saw-operator at the left is sliding a finished piece into a shop trailer

ing has been reduced to a minimum since a saw has been mounted on a moving carriage which runs on tracks paralleling the storage shed. Now it is necessary only to locate the saw carriage opposite the pile of flooring to be cut and to connect the electric-motor power cable in one of the electric outlets installed at intervals along the entire length of the storage shed. Mill-length flooring is fed by a workman on the storage pile to the two men at the saw, one of whom acts as a feeder and the other as saw-operator and loader. There are guide stops on the carriage for the various lengths required. As the rough flooring is cut to lengths, it is slid off of the end of the carriage onto the shop trailers which move it to the required locations.

In addition to reducing the actual handling of this type of car material to a minimum the installation considerably reduces demands upon the services of shop tractors, ties up fewer trailers and cuts down tractor and trailer mileage on each load of flooring handled.

Oelwein Car Repair Track

In the fall of 1943, car repair operations at the Chicago Great Western rip track, Oelwein, Iowa, were literally lifted out of the cinders and mud by the installation of



Concrete runways and other facilities at the C. G. W. car repair tracks, Oelwein, Iowa

concrete runways between all repair tracks and the well-planned line-up of small shop buildings and servicing facilities provided along the northeast side of the repair track area. One unusual feature of these runways, which has demonstrated its value since the original installation, is the fact that the concrete was carried all the way to repair-track rail heads at a level about 1 in. below the heads, being 18 in. deep at this point, to support all jacking loads with an ample safety factor and then tapering in thickness to 5 in. midway between the tracks. A total of about 3,100 cu. yds. of concrete were required for this job.

Referring to the illustration, the general arrangement of the yard, which involves six tracks with an average length of about 500 ft., is apparent. Tracks 12 and 13 are reserved for light repairs and Tracks 14 and 15 for heavy repairs. No. 16 is a run-around track for rail equipment, including the steam-operated crane, and it will be noted that the concrete is carried across this track flush with the rail heads so that motor equipment and material delivery trucks can use this roadway and cross the rails at will. Similarly, a standard-gauge material track was left in the concrete roadway between Tracks 12 and 13. The concrete is carried across the yard as far as midway between Track 12 and Track 11, which is the yard transfer track.

An important additional facility is the provision of 14 acetylene and air stations, and electric welding facilities, conveniently located down the middle of the runway between Tracks 13 and 14. A series of wheel-storage tracks is located at the nearer end of the yard with a single cross track and small turntable for delivering wheels to the material delivery track between Tracks 12 and 13.

A force of 43 car men and helpers is employed at the Oelwein car repair yard and the present output is about 25 light repairs and two heavy repair cars a day.

Shop Trestles

Permanently-located car trestles are used in the Birmingham car shop of the Southern along all of the regular working tracks. These trestles are built of scrap superheater tubes and bar iron welded together to form a post section which operates on a hinged floor section. In the raised position the posts are held in place by a supporting arm which is pinned to a bracket on the upright. The



Side view of one of the trestle posts



The trestle posts in the foreground are shown in both the upright and lowered positions—All cars in the background are set up on trestles so that trucks may be worked

trestle posts are lowered by removing the pin and releasing the supporting arm from the bracket; when lowered they do not interfere in any way with the shifting of cars into or out of the shop.

Air Brake Questions and Answers

HSC Equipment on Passenger Cars and Diesel A and B Locomotive Units Functioning of Parts on Initial Charging

270—Q.—What is the action of the D-22-BR control valve during initial charging? A.—The auxiliary and emergency reservoirs are charged in the same manner as described for the D-22-ER control valves on the locomotive. In addition, the supply reservoirs are charged from two sources: (a) from auxiliary reservoir through the release slide valve, chamber D, port r in the release slide valve, passage rl in the seat, past ball and flat check valves to passage 6 and the supply reservoirs. Spring 84 is overcome and check valves 74 and 87 are unseated, permitting this charging flow as long as auxiliary reservoir pressure is higher than supply reservoir pressure, but when the supply reservoir pressure is higher, it seats the check valves and prevents back flow from supply reservoirs to auxiliary reservoir.

(b) From brake pipe air in chamber A on the face of the service piston through passages 1c and 1d, the cavity in the limiting valve slide valve 136 passages 1k and 1j, past ball check valve 74a and flat check valve 83a to the chamber above flat check valve 87, where the flow combines with the charging flow from auxiliary reservoir through passage rl, thence to the supply reservoirs through passage 6. Spring 89a is overcome and check valves 74a and 73a are unseated, permitting this charging flow as long as brake pipe pressure exceeds supply reservoir pressure. When supply reservoir pressure becomes higher it seats the check valves and prevents back flow from supply reservoirs to brake pipe. Thus the auxiliary emergency and supply reservoirs are charged simultaneously to approximately existing brake pipe pressure.

271—Q.—*What part does the brake valve on the A unit play in this operation?* A.—The brake valve on the A power unit maintains charging connections for all HSC brake application handle positions so that the reservoirs are continuously charged in this manner during HSC electro-pneumatic brake operation. Therefore, the system is constantly recharged when the HSC electro-pneumatic brakes are applied so that the supply for brake applications is always available and adequate.

272—Q.—*How does the FS-1864 relay valve function during initial charging?* A.—At the FS-1864 relay valve, supply reservoir air from connection 6 charges the chamber around application piston and its pilot valve; pipe 16 is open to the control valve, passages 16 and 16a, past double check valve to passages 8a and 8 to the straight air pipe, which is open at the 21-B magnet valve exhaust. This connects diaphragm chambers P, N, K and A of the relay valve through passages 19, 18, 17 and 16a, to the magnet portion. With the M, L and H magnets de-energized, passage 19 is connected past upper magnet valve 161b and choke 138 to passage 15; passages 18 and 17 past lower magnet valves 161 and 161a, and chokes 140 and 142 to passage 15. Passage 15 is connected past unseated supply valve and passage 16c to passage 16. As passage 16 is connected to the 21-B magnet valve exhaust the diaphragm cavities P, N, K and A are exhausted and piston spring 42 holds the diaphragm assembly released. All pressure is thus released from lever 43 which floats freely, permitting the exhaust piston and its valve to remain open, releasing the air from chamber F and connected brake cylinders to exhaust Ex. Chamber A of the switch piston is open to atmosphere. Spring 9, therefore, releases collar 6 which disengages finger 20 from contacts 28 and 28a, thus opening the car battery circuit to the relay cabinet.

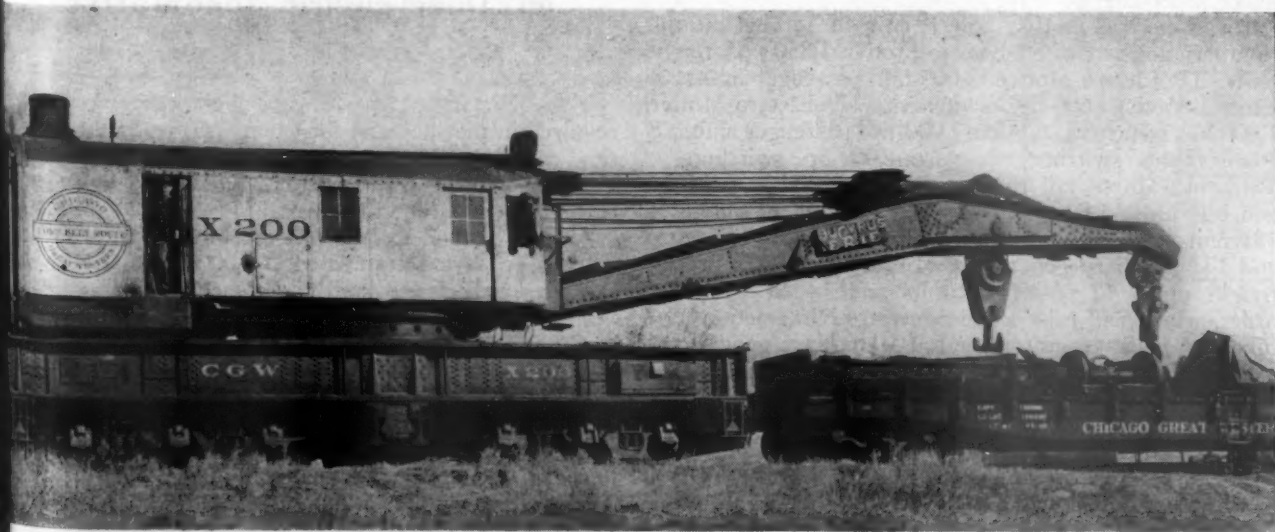
273—Q.—*How does the continuous quick service valve function during initial charging?* A.—At the continuous quick service valve, brake pipe air flows through strainer 39 to piston chamber A, moving the piston 8 and attached slide valve to its inner position on its seal. This piston movement uncovers choke 3, through which brake pipe air charges through passage 2 to the quick service chamber and piston chamber B. Owing to the restricted charging rate through choke 3 and the volume of the quick service chamber, chamber B will charge somewhat more

slowly than chamber A, the greater pressure in the latter meanwhile holding the piston in release position. As the quick service chamber and chamber B become charged to brake pipe pressure, the air pressures on the piston become balanced and the piston remains in release position of its own inertia. Thereafter, as long as the brakes are released, any small fluctuations in brake pipe pressure will equalize with quick service chamber pressure and maintain the piston and slide valve in release position. In this position no connections are made by the slide valve except brake pipe air from passage 1a is present in slide valve cavity h.

Brake Application

274—Q.—*When brake application is made what parts function first?* A.—As explained under MS-40 brake valve, when a brake application is made, the self-lapping portion immediately builds up control pipe pressure corresponding to the position of the brake valve handle. The air pressure developed in the control pipe, by the positioning of the brake valve handle moves valve 4 of the 15-C double check valve, closing the connection between the D-22-ER control valve and master controller. Control pipe pressure builds up in chamber B of the master controller. Application diaphragm 18 is deflected to the right thus moving shaft 32 and contact levers 40 and 41. As spring 24 is compressed, lever 41 first closes release contact, after which spring 32 is compressed and lever 40 closes application contact, thereby energizing the release and application wires, which are connected to application and release magnet valves of the 21B magnet brackets on the locomotives and cars throughout the train. The armatures of the 21-B magnets are pulled down against spring pressure beneath the valves. Release magnet valve 62 is seated, closing off the straight air pipe exhaust passage x in each magnet bracket, and application magnet valve 34 is unseated, opening passage 6a to 4b. Auxiliary reservoir air thus flows to the straight air pipe, building up the straight air pipe pressure throughout the train. Cut-off valve 5 of the 21-B magnet is held unseated by spring 17, permitting the auxiliary reservoir air flow to passage 6a as long as the auxiliary reservoir pressure exceeds approximately 75 lb., which is the value of spring 10.

* * *



A Chicago Great Western 200-ton wrecking derrick

ELECTRICAL SECTION

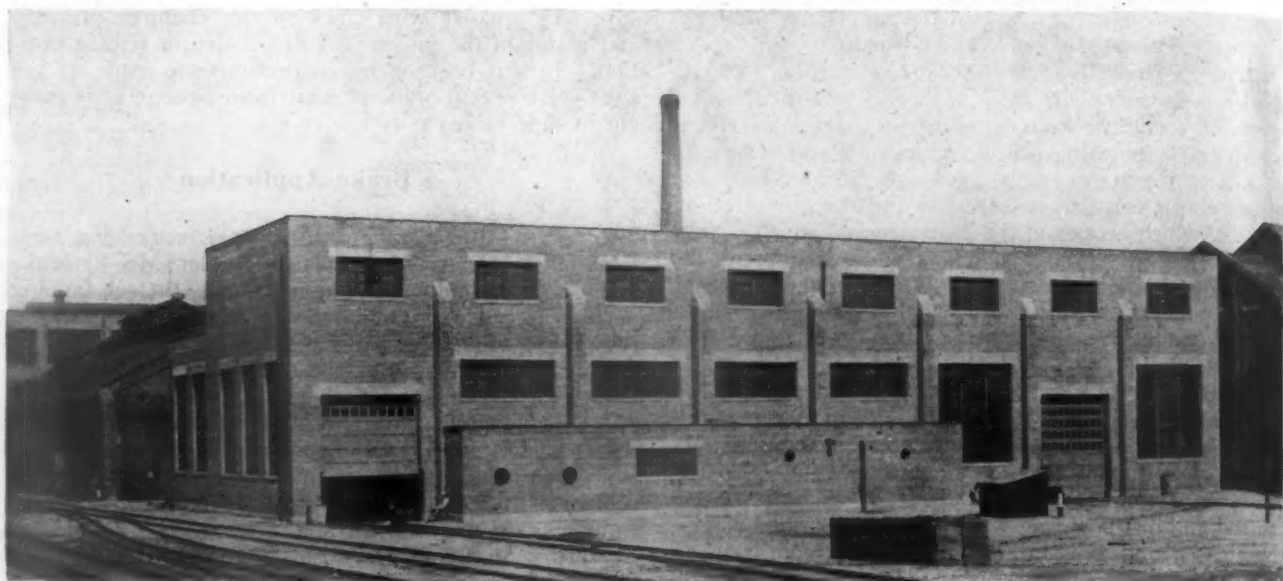


Fig. 1—The electrical shop for servicing of Diesel-electric motive power used by the Southern

Electrical Shop for Diesels

THE Pegram Shops of the Southern at Atlanta, Ga., have been equipped to maintain all traction motors and generators of the Diesel-electric power used on the railway. Mechanical maintenance is done in a section of the locomotive erecting shop arranged for that purpose and electrical work has been segregated in a separate new building adjoining the erecting shop. This article deals only with electrical shop facilities and electrical maintenance procedure.

Diesel-electric motive power now in service on the Southern consists of 56 Electro-Motive 1,350-hp. freight units, 11 Electro-Motive 2,000-hp. passenger units, 4 Electro-Motive 600-hp. switchers, 17 Electro-Motive 1,000-hp. switchers, 6 Alco 2,000-hp. passenger units, 8 Alco 660-hp. switchers, 21 Alco 1,000-hp. switchers, 6 Fairbanks-Morse rail cars, 1 Baldwin 600-hp. switcher and 1 Baldwin 1,000-hp. switcher. This makes a total of 131 units with 512 traction motors, 131 main generators and 131 auxiliary generators. In addition there are 20 freight units, 12 passenger units and 14 switchers on order, which will raise these figures to 696 traction motors, 184 main generators and 184 auxiliary generators.

The electrical shop is designed to perform all motor and generator repair work for the Southern system. The greater part of the shop is given over to Diesel-electric locomotive motors and generators, but one space including about 20 per cent of the floor area is equipped for small motor repair.

Spare motors, amounting to about ten per cent of the total are used for rotation in service to provide for time

Part I

Southern installs new facilities at Atlanta, Ga., for overhaul and repairs of all traction motors and generators used on Diesel-electric locomotives

required in the shop and for emergencies. At the present time rewinding is being done by the manufacturers, but the shop is being equipped for winding and will assume this work some time this year.

Motors of road locomotives are brought into the shop when they have accumulated 200,000 miles, where they are inspected, cleaned and given such repairs as may be needed. Motors of switching locomotives are overhauled on four-year intervals. Accidental damage may of course cause a motor to be brought in within this period. Armatures are vacuum impregnated with insulating varnish (Fig. 4) and baked, after which they are balanced before assembly into a frame. Consideration is also being given to the value of seasoning commutators.

The electrical shop is housed in a new brick building (Fig. 1), the main section of which is 162 ft. long and 82 ft. wide. At one side a single-story extension, 18 ft. by

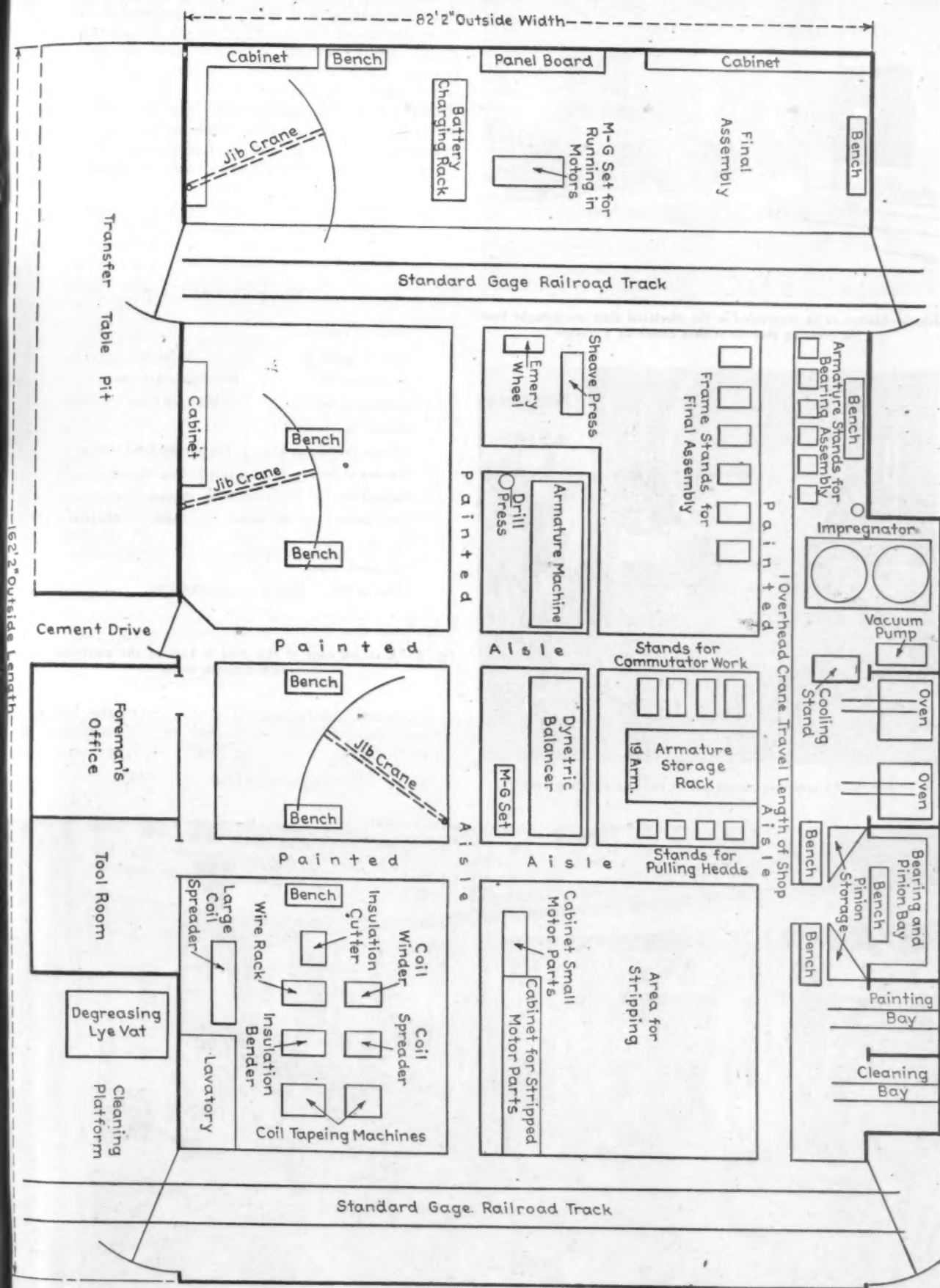


Fig. 3—A plan view of the electrical shop showing layout of the equipment

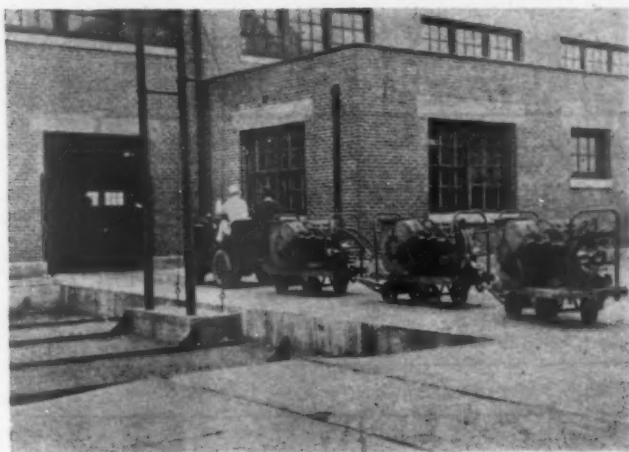


Fig. 3—Motors to be overhauled in the electrical shop are brought from the erecting shop on trailers drawn by a tractor



Fig. 4—An armature comes out of the impregnating tank

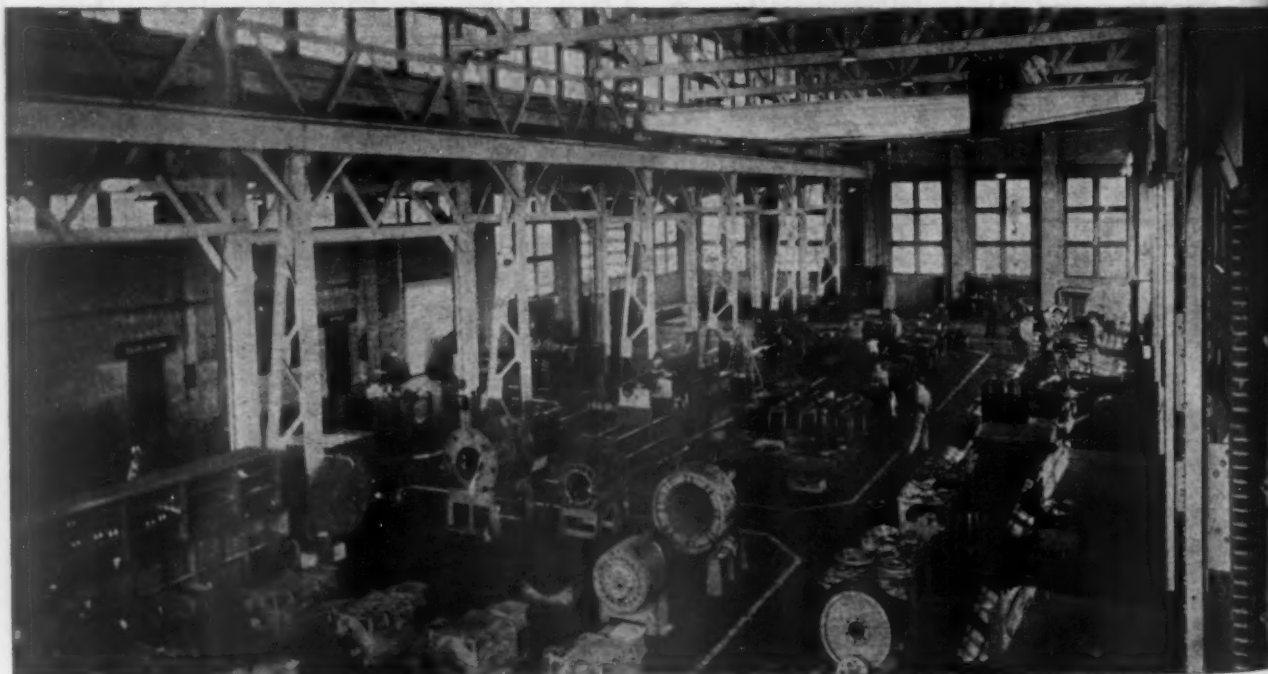


Fig. 5—Interior view of the electrical shop

36 ft., houses the foreman's office and a tool and supply room in which supplies for current needs are carried. On the opposite side of the shop is another single-story extension about 9 ft. by 70 ft. which houses impregnating tanks, ovens, bearing overhaul facilities which do not require crane service, and painting and cleaning bays which need to be segregated from other shop operations. Exhaust fans at the back of the cleaning and painting bays further assure that cleaning fluid and paint fumes do not get out into the shop and serve to protect the men doing the work. Interior of electrical shop is shown in Fig. 5.

SHOP RECORD CARD

Name of equipment	Manufacturer
Type or model No.	Serial No.
Requisition No.	Date received in shop
Locomotive No.	Received from
Reason for removal	
Mileage this application	Total accumulated mileage
Number of days in shop	Date shipped
Shipped to	How shipped
Approximate cost of repairs	Labor
	Material
Job No.	
For detail report	
Refer to File	Serial No.

Fig. 6—A record card of this kind is kept in the electrical shop for each traction motor

A ten-ton, floor-operated crane serves the half of the shop as shown in the upper half of the shop floor plan. Other locations where the lifting of heavy parts is re-

(Continued on page 224)

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Railway M
MAY, 1941

Railroad Enginehouse Lighting

By William H. Kahler*

ENGINEHOUSE lighting presents several very difficult problems because the visual tasks involve poor contrasts and are in vertical planes on the sides of the locomotives. Excessive dirt from the smoke reduces lighting efficiency and the sulphur in the smoke creates a possibility of severe corrosion of metal parts. On the basis of these conditions, the following requirements apply to the lighting of an enginehouse:

1—Illumination on the sides of the locomotive should be adequate to enable workmen to service the equipment properly and quickly. The use of portable lights should be reduced to only those operations which are impractical to illuminate by general lighting.

2—Sufficient light also should be provided over the entire floor area of the stalls.

3—Lighting control should be arranged to permit illumination of any one stall, without lighting adjacent stalls.

4—Luminaires must be constructed and finished to resist the corrosive conditions.

5—Luminaires must be dust-tight to minimize light depreciation due to dirt and to protect the electrical parts from corrosion.

6—Luminaires should be easy to relamp and service.

The Luminaires

Two types of luminaires are required for the typical steam locomotive enginehouse—one for the locomotive

* Lighting engineer, Westinghouse Electric & Mfg. Company, Cleveland, Ohio.

Use of 500-watt dust- and vapor-tight lighting units, and conduit coated with no-oxide grease type paint make a good and enduring lighting system

side lighting and the other for the areas at the ends of the stalls.

A special heavy duty concentrator was developed to illuminate the sides. This unit, illustrated in Fig. 3, consists of a steel housing, hinged cover, cast iron socket enclosure and an inner Alzak aluminum reflector. The socket enclosure is fitted with a cast swivel for rigid mounting from conduit at the required angle. A horizontal spread lens is mounted in the cover to spread the light more uniformly along the locomotive sides.

The unit for the ends of the stalls is of similar construction with steel housing, inner Alzak aluminum reflector and hinged cover (Fig. 4).

Both units are completely dust- and vapor-tight. They are finished with corrosion-resisting baked-on enamels to withstand the smoke fumes.



Fig. 1—Typical enginehouse stalls illuminated with 500-watt heavy-duty enclosed units designed for enginehouse service—Note concentration of light on sides of locomotives as well as adequate general illumination

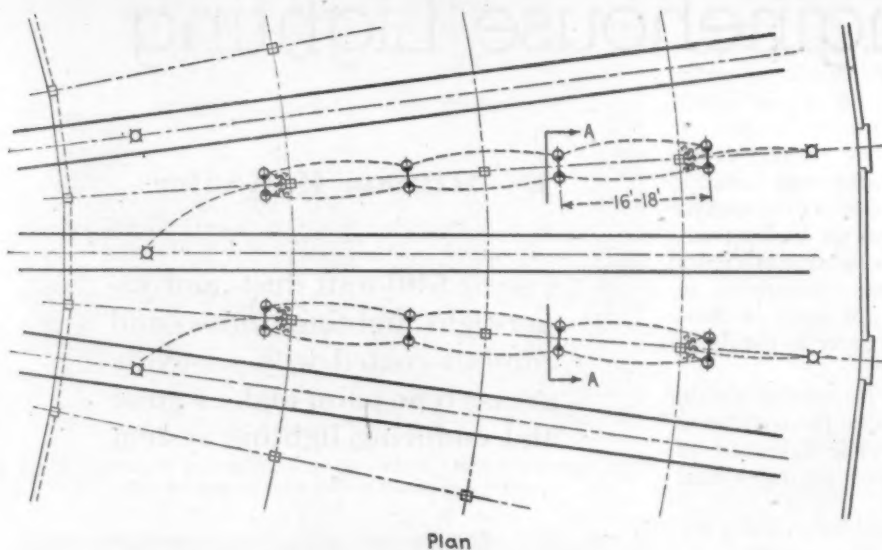


Fig. 2—Typical lighting layout for enginehouse stall—Units are tilted to center light beam on work area

Fig. 2 illustrates the recommended layout for a typical engine stall. Four 500-watt concentrators are required on each side of the average stall. They should be mounted about 18 ft. above the floor on 16- to 18-ft. centers and directed to give maximum vertical lighting. This arrangement with 500-watt lamps will give approximately 20-25 footcandles initially on the sides of the locomotives.

One 500-watt, dust-tight enclosed luminaire (Fig. 4) should be installed at each end of the stalls for general illumination.

Installation Experience

The wiring should be so arranged to permit any one stall to be illuminated without lighting the others. A convenient means of control can be provided by locating three-way switches at each end of the stall.

Several installations of this description have been in service for some time and results to date are excellent.



Fig. 3—Heavy-duty enginehouse concentrator designed to resist corrosion and minimize maintenance



Fig. 4—Totally enclosed dust-tight luminaire for end-of-stall lighting and other general illumination applications

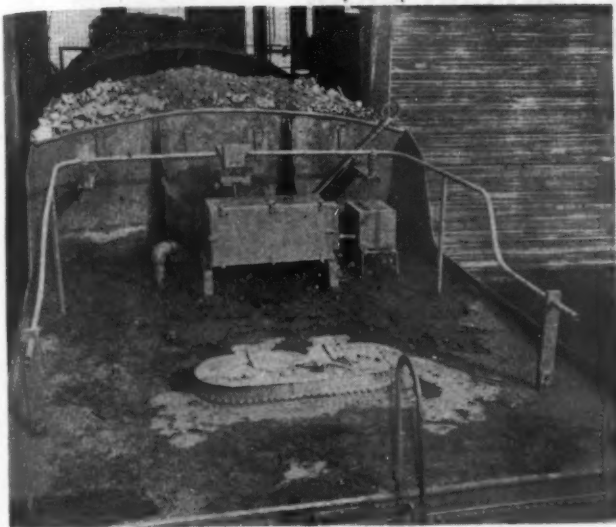
One such system completed in 1936 is worthy of detailed mention. Galvanized conduit was installed and every three years was coated with a lead and oil paint. In a few years severe conduit corrosion was observed, then the entire conduit system was coated with a no-oxide grease type paint. This treatment prevented further corrosion and appears to be the solution to the corrosion problem.

Good Maintenance is Vital

Experience has definitely proven that regular and careful maintenance is vital to the life of an enginehouse lighting system. When corrosion is checked in the early stages, a well designed system will be relatively trouble-free for many years.

With the current severe overload on railway equipment, it is essential that locomotives be serviced carefully but quickly. Better enginehouse lighting for around-the-clock operation is one answer to this serious railroad problem.

New Haven Tests Train Radio



The dipole antenna is grounded at nodal points to afford protection from possible contact with live overhead wires—The end portions are bent down to make room for the water spout

A DEMONSTRATION of space radio train communication was made on the New York, New Haven & Hartford on April 17 with equipment manufactured by the Westinghouse Electric and Manufacturing Company. One set of equipment was installed as a fixed unit in the railroad station at New Haven, Conn., and two units respectively on locomotive No. 3205 and a caboose No. C-580. For the demonstration the mobile units were attached to opposite ends of a hundred-car freight train and run from New Haven to Danbury, Conn., over a rugged terrain involving many curves. Good loud speaker reception was maintained at all times between the locomotive and the caboose and for a distance of about 10 miles, between the fixed station and the train. To indicate the usefulness of the radio it was employed for announcing readiness of departure from either end of the train, for notifying the engineman when the train line pressure was up in the caboose, for indicating where the train was to be cut in switching operations, for advising the position of the ends of the train when it was placed on a siding, etc. No emergencies such as hot journals developed during the run.

One point of interest occurred at starting when the engineman notified the conductor the moment the locomotive started, and a watch in the caboose showed that the time to take slack and start the caboose was 48 seconds.

Radio Equipment

The radio sets used at the three locations are essentially similar except that the antenna output of the mobile sets is 30 watts while that of the fixed station is 60 watts. The experimental frequency employed is 30.66 megacycles.

Each set is shock-mounted in a dust tight box and consists of a transmitter, a power unit and a receiver. The transmitters employ a crystal frequency of 958.125 kilocycles multiplied 32 times to produce the carrier frequency of 30.66 mg. The frequency deviation of the

Continuous contact maintained between locomotive and caboose with no appreciable fading either in cuts or on curves

carrier is plus or minus 15 kilocycles. The receivers are triple detection, super-heterodyne, crystal-controlled oscillators, operating at 4.315 mg.

Standby power required for one of the mobile sets is 135 watts, while full operation requires 220 watts input to the set. On the locomotive the necessary power was obtained from the headlight generator and converted from 32 volts d. c. to 110 volts, 60 cycle, a. c., by a rotary converter. For the purpose of the test, a baggage car having axle generator equipment was coupled in the train adjacent to the caboose and power taken from the electrical system on the baggage car for the operation of the caboose equipment. Communication is maintained through push-to-talk hand sets, a loud speaker being used at each location, primarily for calling. The quality of transmission, however, is such that the loud speakers make an entirely satisfactory means of communication.

Antennae

The antennae used on the portable units were developed on the location and are of special interest since they had to be mounted within narrow clearance limits, and had also to be protected against possible contact with the 11,000-



A push-to-talk hand set is used at both mobile and fixed stations

volt overhead trolley in electrified territory. The type selected for both locomotive and caboose and shown in one of the illustrations, is a dipole antenna consisting of two members, each one-half wave length long. Connection from the set to the antenna is made through coaxial cable



The loudspeaker shown in the cupola can be used for conversation, but is normally used only for calling



W. A. Moore, general superintendent of electric transmission and communications, inspects the contents of the equipment box in the caboose — This consists of a transmitter, power unit and receiver, all shock-mounted

with inductive coupling between the end of the coaxial cable and the two adjacent ends of the antenna halves. The center or nodal point of each half antenna is grounded. This grounding has no effect on the efficiency of antenna radiation but affords complete protection from contact with the overhead wire since there is no physical connection between the antenna and the set. The fixed antenna on the station at New Haven is mounted about 100 ft. above the ground and consists of two horizontal rings 56 in. in diameter grounded at one side and open at the other. Radiation from all three antennae is a maximum horizontally and is practically equal in all directions.

This is the third experiment the New Haven has made with radio train communication, the first having been made in 1934 and the second in 1944.

Electrical Shop For Diesel Engines

(Continued from page 220)

quired are served by jib cranes. Winding of shop motors is done in the section of the shop shown in the lower right-hand corner of the shop plan drawing. The section at the lower-left will be devoted to winding of traction motor and generator armatures. A plan view of the shop is shown in Fig. 2.

Procedure

Equipment to be reconditioned is hauled from the erecting shop or storehouse on tractor-drawn trailers (Fig. 3).

Normally the motors are delivered to the east or left end of the shop where the motor-generator set is located. Here they are inspected and given a Megger insulation test and a running test with d.c. power at about 125 volts from the m.g. set. The amount of work to be done is determined by the shop record card shown as Fig. 6 and by the condition of the motor as indicated by the inspection. A preliminary inspection report is shown in Fig. 7.

After the preliminary test and inspection, the motor is moved by means of the crane to the west or right-end

PRELIMINARY INSPECTION

Job No.	
Serial No.	Name of equipment
Type or model No.	Manufacturer
Date received in shop	From
Armature serial No.	Pinion serial No.
Condition of commutator.	Pinion
Condition of brushholders	Brushes
Condition of external cables.	
Do both axle caps have same Serial No. as frame.	
Are grease pipes in good condition C. E.	P. E.
Is general condition of equipment clean or dirty.	
List below any major parts missing.	
.....	
Note 1	
Note 2	
Electrician	Machinist

Fig. 7—The requirements as indicated by the shop record card and the preliminary inspection report shown above determine the amount of work to be done on each motor

of the shop from which point the motor moves progressively through the shop to final testing.

[Overhaul procedure will be described in Part II of this article.—Editor.]

C. N. Telegraphs Employs Pole Setting Machines

Two pole-setting machines have recently been placed in service by the Canadian National Telegraphs. The users report that one of the machines can dig a six-foot hole in less than three minutes. In addition to dig-

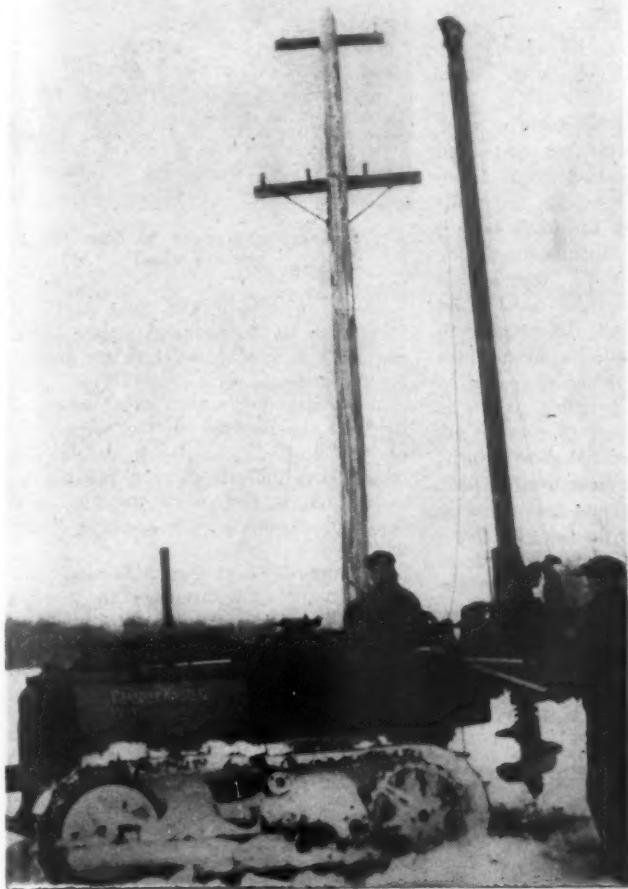
ging the hole at almost any angle desired, the machine can pick up the pole and place it in position and can also uproot and remove old poles without requiring any softening up of the earth. The device is mounted on a Diesel Caterpillar tractor with over-size tread. The tube which houses the shank of the digging auger is fitted at the top with a pulley sheave and functions as a gin pole. A winch driven by the tractor engine does the lifting. With the aid of the machine, a three-man crew can set a mile of poles in one day. This amount of work previously required a gang of eight men for at least five days. Either a 16-in. or a 20-in. auger can be used. One of the units is now in operation in Mount Albert, Ont., 40 miles north of Toronto; the other, at Lundar, Man., 70 miles north of Winnipeg.

C. P. R. Coach Is Fluorescent Lighted

Fluorescent lighting was installed in the Canadian Pacific coach No. 2169 while it was in the railroad's Angus shops at Montreal for general overhaul. The reconditioned car was placed on exhibit on March 1. It was one of the last to be built since the war started and the shopping period coincided with the receipt of a limited amount of lamps, plastics and a motor-generator set.

The car is lighted by thirty-six 14-watt, 15-in. T12 fluorescent lamps over the seats and fourteen 15-watt, 18-in., T8 lamps mounted on the surface of the ceiling for general lighting. The car has a seating capacity of 72 and there is a transversely mounted unit over each seat equipped with a plastic shade recessed into the underside of the parcel rack and an individual switch at the outer end of each fixture. The ceiling units are also transversely mounted. The lamps operate on 115 volts a.c. from a 1,200-watt motor-generator set supplied by the Safety Car Heating & Lighting Company of New Haven, Conn. The motor-generator set in turn receives its power from a 30-volt, gear-driven auxiliary.

The average lighting intensity on the 33-in. 45-deg. reading plane as taken at 20 locations is 5.7 foot-candles.



The machine digs holes and also sets and removes poles



Reconditioned Canadian Pacific coach equipped with fluorescent lighting

NEW DEVICES

Grinder for Finishing Contours

The grinding of contour tools such as flange and tread finishing tools for wheel work has always presented a difficult problem. The Gorham Tool Company, Detroit, Mich., has developed a contour grinder known as the Gorham-Baker grinder for



Gorham-Baker grinder for contour tools

sharpening these tools in its own shop and is now making this machine available for railroad use. Although this grinder was developed primarily for grinding form tools for railroad tires and wheels, it can be used for a variety of form grinding operations.

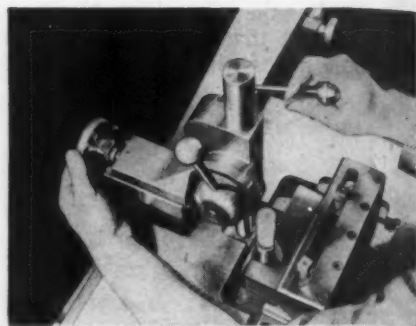
The machine has a three-speed, V-belt-driven, vertical spindle mounted in anti-friction bearings. When using straight grinding wheels, a power vertical reciprocating motion can be imparted to the entire spindle assembly. A lever controls the mechanism which actuates the reciprocating motion so that it may be thrown out when using a taper wheel or when dressing the grinding wheels.

The table consists of three plates, the bottom one of which is bolted to the knee of the machine and can be tilted 10 deg. each side of horizontal for grinding side clearance. A pointer and protractor scale indicates the degree of angularity. The middle plate rides on balls running in grooves, permitting free motion in relation to the stationary bottom plate. The top plate likewise rides on balls in grooves that are at right angles to the grooves in the bottom and middle plate. This permits free sidewise motion between top and middle

plates. This combination of motions makes it possible to move the plate in any direction required to follow a contour. All three plates may be locked together. In the locked position the top plate is located so that the work is clear of the wheel and a cut-out in the plate permits the wheel dressing diamond to pass entirely by the wheel length.

The template to which the form is to be ground is fastened to the top plate and clamped against the backing plate which takes the thrust on the template and holds the template square with the work holder. Slots permit sidewise adjustments of the template. In operation the template is brought against a roller which revolves on a stud carried on a block dovetailed into the bottom plate. The rollers against which the template rides are precision ground to step diameters and the grinding wheel, as later described, is dressed to correspond. The position of the dovetailed slide governs the relation of the work piece to the wheel. The feed of the work into the grinding wheel is controlled by the knurled hand wheel which moves the dovetailed slide in or out. Since both the template and the work are attached to the top plate, the form of the template is accurately ground on the work.

The work holding block slides in a channel in the top plate. The bottom of the



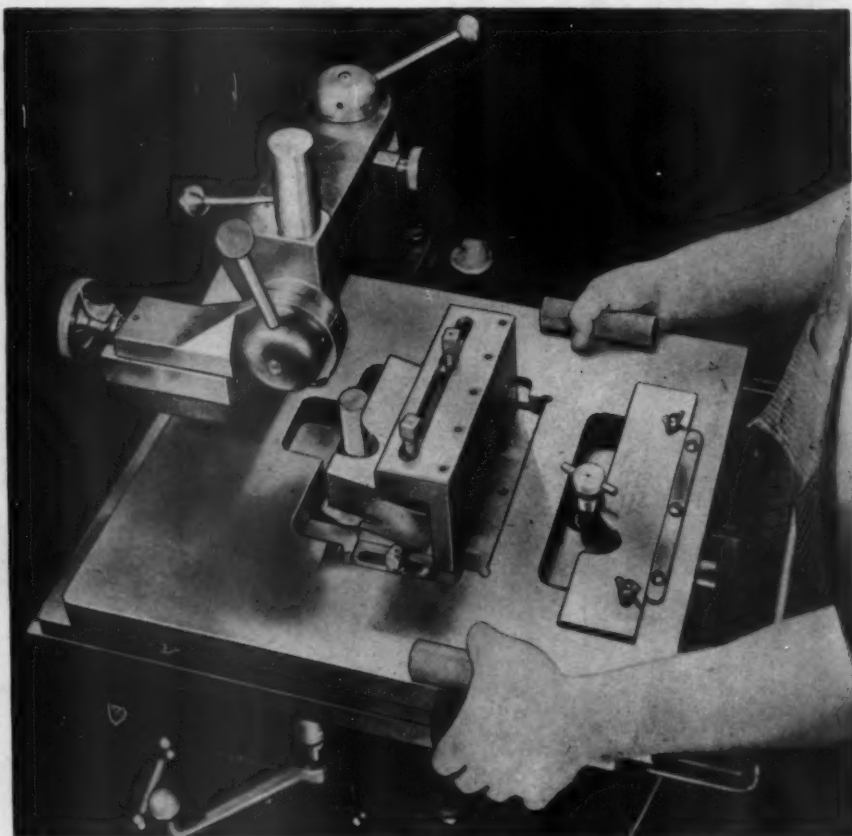
Setting the diamond to dress the grinding wheel

holder is ground in the plane of the top plate with the background square so that the work is held parallel to the template back plate.

When grinding with a taper wheel, the work is clamped flat on the bottom plate of the holder. A 10-deg. angle block which keys into the bottom plate is furnished for staging work to grind a 10-deg. end clearance when using a straight wheel.

A diamond wheel dresser is mounted on a dovetailed slide attached to a swivel arm. The dressing head rotates 40 deg. each side of vertical for dressing taper wheels. The travel of the dresser is controlled by a hand lever. The angle of

(Continued on next left-hand page)



The template against the roller controls the grinding wheel

CHILLED CAR WHEELS

ROLL UP new high

In the face of severe shortages of foundry manpower . . . in a year which was no less tough for car equipment manufacturers than for the rail-ways with their staggering ton-mile totals . . . 1944 figures show a creditable increase in the number of chilled car wheels shipped. Yet the quantity demands of an ever-increasing load have resulted in no sacrifice in product quality. The AMCCW Code of Practice sees to that. It's a code to which every member manufacturer must subscribe, and which must be followed in every respect if membership in good standing is to be retained.

1944
3,218,089

1943
3,001,893

1942
2,682,000

1941
2,273,825

1940
1,745,000

1939
1,459,000

1938
1,279,920

CHILLED CAR WHEELS SAVE *four* WAYS . . .

1. Lowest Cost per mile
2. Increased Rail Life
3. Increased Brake Shoe Life
4. Reduced Machine Shop Cost



ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE, NEW YORK, N. Y. • 443 NORTH SACRAMENTO BOULEVARD, CHICAGO, ILL.

Organized to achieve: Uniform specifications — Uniform inspection — Uniform product

the dressing head is read directly from a graduated scale. The feed of the diamond to the wheel is governed by a knurled graduated hand wheel controlling the movement of the dovetailed slide. The graduations on this knurled wheel are on the side facing the operator so that the grinding wheel diameter may be reduced in increments corresponding to the diameter steps on the follower rollers.

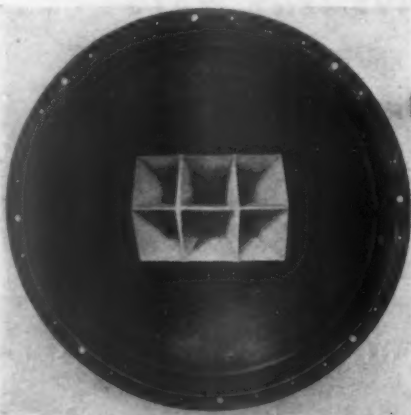
In grinding the Tru-Form tool the operator first selects the template that suits the tool. The straight grinding wheel is used and if dressing is needed this is done with the setting at zero. The diameter of the grinding wheel is measured and a follower of the same diameter is selected. On subsequent dressings the diamond is moved in by multiples of .005 in. so that the follower can be selected without actually measuring the wheel each time. The tool is clamped in the holder, adjusted and the grinding done by moving the table as permitted by the action of the follower against the template. The tool is ground to match the template.

The procedure for grinding constant-clearance tools is much the same except that a tapered wheel is used. When dressing the tapered wheel the dresser is swivelled to a 6-deg. angle. Only the .750 in. diameter follower is used with tapered wheels. After dressing the wheel a gauge is used to adjust the tool height by means of the knee elevation so that the wheel diameter at the cutting edge of the tool is .750 in. diameter thereby assuring a contour being ground on the tool an exact duplicate of the template.

The Gorham-Baker grinder is driven by a 1½-hp. motor operating on 220/440 volts alternating current. Spindle speeds of 4,500, 6,500 and 10,150 r.p.m. are used. The weight of the machine is 1,100 lb. and the space required is 24 in. by 28 in. by 52 in. high.

High Fidelity Loud Speaker

A loud speaker suitable for various applications of public address systems is being offered by the Altec Lansing Corporation, Hollywood, Calif. The reproduction of high and low frequencies is accomplished by a

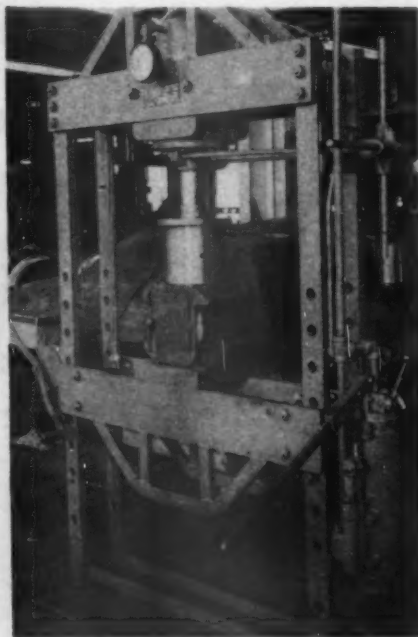


The speaker is designed to radiate over a wide range of frequencies and is rated at 15 watts

multi-cellular high-frequency unit placed within a conical low-frequency unit. The high-frequency unit employs an aluminum-alloy metal diaphragm, while the low-frequency assembly is mounted in a 15-in. stiff paper cone. Voice coils are wound with rectangular wire operating in the fields of permanent magnets having high flux density. The speaker is available separately or mounted in a walnut finished cabinet which provides 8 cu. ft. of air space to allow for a wide range of tonal quality. The speaker itself requires less than 1½ cu. ft. of space. A compact 60-decibel-gain amplifier with a 15-watt output can be had for driving the speaker.

75-Ton Portable Hydraulic Press

In connection with the maintenance of roller bearings on railway equipment, one of the important requirements is a powerful, accurate and quick-acting hydraulic press for removing and re-applying outer races, cups and bearings. The machine illustrated



Applying the outer race in a roller-bearing journal box

is a 75-ton portable hydraulic press, made by K. R. Wilson, Buffalo, N. Y., and now in service at the 47th Street, Chicago, shops of the Chicago, Rock Island & Pacific.

The machine has a piston travel of 12 in. and a table adjustment of 3 ft., by means of a hand winch at the left and removable stop plugs in the sidebar holes which support the truss-reinforced table structure. The controls are designed so that the ram is brought quickly to the work by operation of the hand lever at the right in conjunction with the large low-pressure cylinder. A simple shift of the control lever then applies pressure through a smaller cylinder which gives pressures up to 75 tons on the machine. Gauge pressures above 75

tons on the gauge are shown on a red dial as a warning to press operators.

In addition to the work in connection with roller bearings, the press is used for applying bushings in brake levers and heads, straightening shafts up to 4 in. in diameter with an accuracy of .002 in., and many other similar jobs.

Portable A.C. Test Sets

Two portable a.c. test sets, capable of supplying smooth test voltages from 0 to maximum rated voltages (2,000 and 6,000



One of the 2,000-volt test sets, showing supply lead, test leads, and handwheel connected to autotransformer

volts), have been announced by the General Electric Company. Either set can operate from any 115-volt, 50- or 60-cycle outlet, and each has a capacity of 2,000 volt-amperes. The units were developed especially for testing Diesel-electric locomotives larger than 600-hp., but have other testing applications such as generators, motors, motor parts and appliances.

Both sets consist of a dry-type step-up transformer, variable-voltage autotransformer, two indicating voltmeters, voltmeter selector switch, signal lamp, air circuit breaker with magnetic overload trip and a supply switch. Two 15-ft. shielded test leads with insulated handles and a 15-ft. supply cord with plug are also included. One of the indicating voltmeters is used to measure voltages up to half of the maximum rating, and the other up to full test voltage. This assures accuracy of results and eliminates guesswork, even when testing at relatively low voltages.

These compactly constructed sets are housed in rectangular steel cases mounted on three-wheel trucks and grounded through the third conductor in the supply lead. When the sets are not in use, the three leads are coiled and hung on hooks attached to the rear panel of the case. A handle that remains in a vertical position when not in use is provided so that the set may be easily moved.

Both sets are 19 in. high. The 2,000-volt unit is 18 in. wide, 22 in. long and weighs 290 lb., while the 6,000-volt set weighs 325 lb. and is 15 by 25 in.



FREIGHT WILL AGAIN
"Highball"
Between
Los Angeles and San Francisco

Before the war freight was highballed on the Southern Pacific between Los Angeles and San Francisco, making the 425 mile run overnight.

The trains were hauled by the same class of 4-8-4 super-power Lima locomotives that speed its famous passenger trains . . . the streamlined "Daylights."

The Southern Pacific plans to resume this cannonball freight service as soon as possible in the post-war period and is already equipped with the motive power, now having a fleet of sixty 4-8-4 Lima locomotives to be utilized on its "Overnights" as well as its "Daylights."

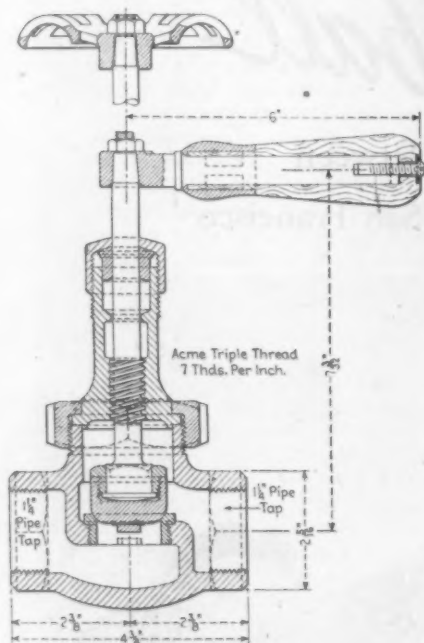
LIMA LOCOMOTIVE WORKS,

LIMA
LOCOMOTIVE WORKS
INCORPORATED

INCORPORATED, LIMA, OHIO

Quick-Acting Blower Valve

A quick acting 1¼-in. blower valve has been developed by the T-Z Railway Equipment Company, Chicago, all parts of which are A.A.R. standard except for the stem and the bronze bonnet. The Acme triple thread,



The T-Z quick-acting blower valve

seven threads per inch, on the brass stem permits the valve to be fully opened or closed quickly by turning either the A.A.R. standard hand wheel or the lever. The stem is fitted with a removable ball-type disc seat made of nickel-alloy. This disc, in turn, seats into a removable ring made of the same material.

It can be furnished with a globe or an angle valve body, both of which are made of steel. All other parts are made either of brass or bronze.

Vibration Recorder

An instrument called the Vibrograph has been produced by the Westinghouse Electric & Manufacturing Company to meet the requirement for a quick simple means of recording vibration on the spot. The instrument, which looks something like a box camera, weighs less than nine pounds and requires no power connection. It writes a permanent record of vibrations over the range of 600 to 15,000 cycles per minute with amplitudes as low as one ten thousandth of an inch or as great as one sixteenth of an inch. The record and a timing wave, which are drawn by a stylus on a transparent plastic tape one inch wide, are viewed by a low-power microscope.

The Vibrograph is a mechanical device and achieves mechanical amplifications of about eight, using the same principle by which earthquakes are recorded. It consists essentially of a frame containing a mass suspended by a weak spring. A



The instrument is a mechanical device which amplifies and records vibration

pointer attached to the mass indicates relative motion between the frame and mass when the frame is applied to a vibrating body. The record is made on the tape, either when the instrument is placed on the vibrating body or when held in the hand, and the vibration is picked up by a prod.

Magnaflux Unit

A Magnaflux unit designed especially for the railroad field has recently been introduced by Magnaflux Corporation, 5900 Northwest Highway, Chicago 31. This unit is suitable for the detection of fatigue cracks and other discontinuities in practically all locomotive, car and similar steel parts. It is recommended for use in enginehouses, car shops, etc.

Designated as Type KT-2.5, this unit is of push-cart style, has folding handlebars and is equipped with 16-in. rubber tired wheels and heavy eyebolts to facilitate handling. It is ruggedly and compactly con-

structed with an all welded steel frame.

The KT-2.5 unit delivers high values of alternating current at low voltage which may be used for both magnetization and demagnetization. It is usually constructed for interchangeable operation on 220- or 440-volt, 60-cycle, a.c. circuits, and may be obtained for operation on other standard voltages and frequencies.

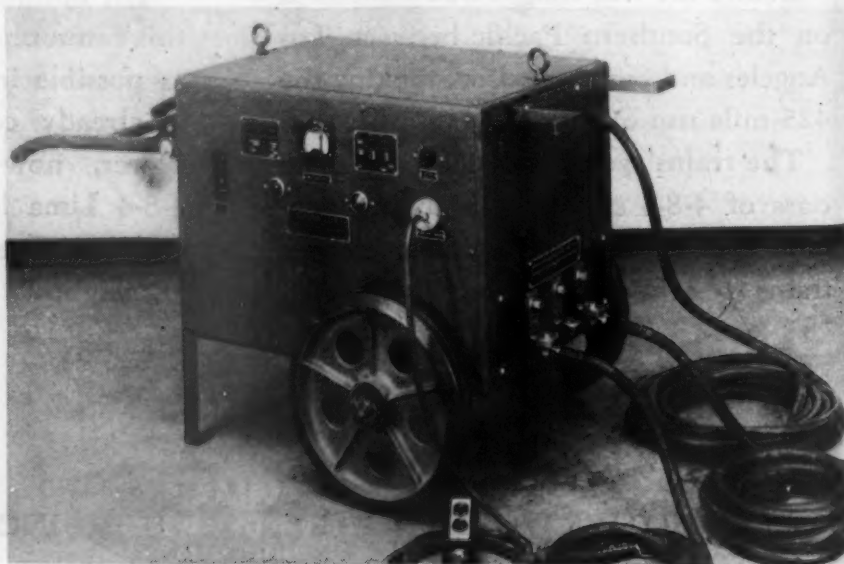
Ground Resistance Tester

An instrument for testing ground resistance, designated as Model 255 Vibroground, having ranges of 0/3, 0/30, 0/300 and 0/3,000 ohms, is being offered by Associ-



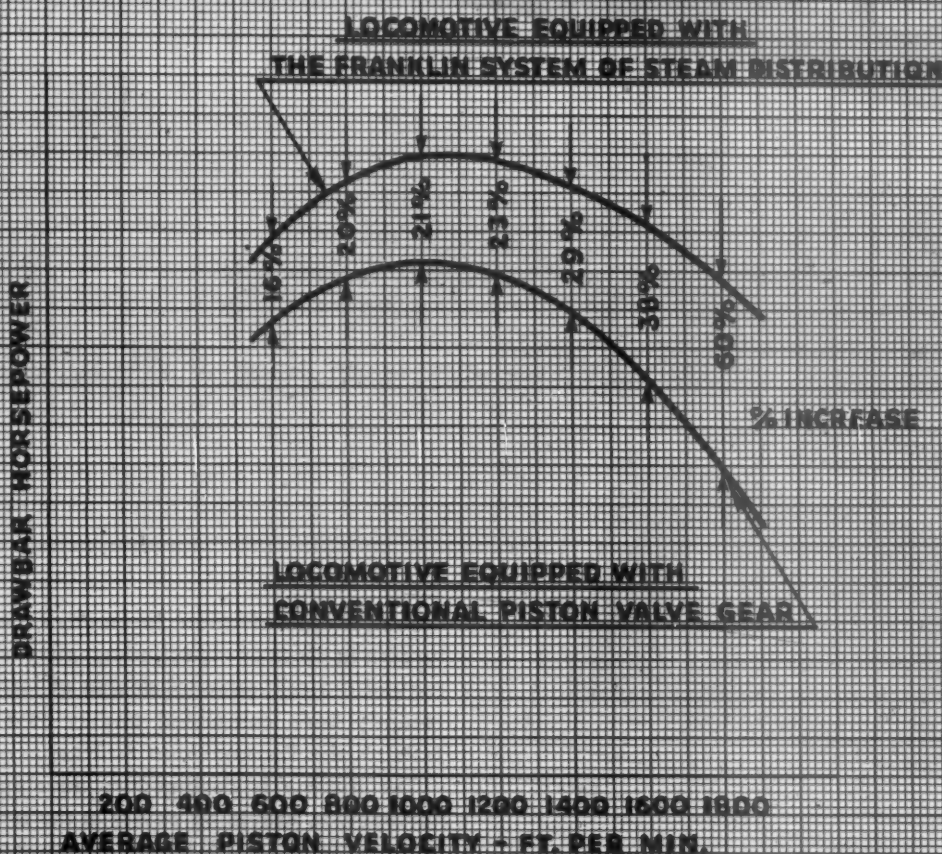
The set is suitable for measuring ground resistance under conditions of extreme dryness or moisture

ated Research Incorporated, Chicago. A test voltage of 175 is developed by a synchronous self-rectifying vibrator, receiving its power from two dry-cells. Voltage measurements are made by means of a potentiometer and a D'Arsonval galvanometer reading directly in resistance when a condition of voltage balance is obtained.



Magnaflux unit designed especially for railroad use

Increase in Drawbar Horsepower
 obtained with
 typical application of
**THE FRANKLIN SYSTEM
 of STEAM DISTRIBUTION**



Both curves are established on the basis of the same amount of steam to the cylinders. The Franklin System assures a substantial increase in horsepower output and economy, for either passenger or high speed freight service.



FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK • CHICAGO

In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

better combustion



Position of Security Circulators in firebox of turbine locomotive

A new type of steam locomotive, powered by a turbine in place of the cylinders, pistons and driving rods of the conventional design of locomotive, has recently been completed and is now undergoing tests on the Pennsylvania Railroad.

The turbine is designed to develop 6900-shaft horsepower, providing power at the tender coupled sufficient to pull a full-length passenger train at 100 miles an hour or to operate heavy freight trains at high speeds.

American Arch

SECURITY CIRCULATOR DIVISION

for the New

STEAM TURBINE LOCOMOTIVE

BY THE APPLICATION OF

SECURITY CIRCULATORS

• This new type of steam locomotive, undergoing tests for the Pennsylvania Railroad, is creating interest in all railroad engineering departments. It is modern, advanced and a product of years' experience in locomotive development by the railroad and the builders.

The Security Circulators used to support the arch and as a circulating device in the firebox of this locomotive were the culmination of proven ability in other classes of power.

The following advantages are secured through the application of Security Circulators.

Security Circulator equipped locomotives are available for continuous operation for longer periods than other locomotives because they have cleaner flues, longer arch life, and improved combustion so that boiler maintenance is greatly reduced.

With Security Circulators circulation is improved over crown sheets and in side water-legs; and honeycombing, flue plugging and cinder cutting are reduced.

The installation of Security Circulators permits the use of a 100% arch in any type of fire box and increases the life of the arch brick.

Company, Inc.

NEW YORK • CHICAGO

NEWS



A proposed Chesapeake & Ohio steam-turbine-electric locomotive

Propose Steam-Turbine Locomotives for the C & O.

THE Chesapeake & Ohio, on March 28, asked W. P. B. permission to build three coal-burning turbine-electric locomotives. The new locomotives will develop 6,000 hp. delivered from a steam turbine to generators and will be capable of running more than 100 miles an hour.

The Baldwin Locomotive Works already has completed the basic designs. C. & O. engineering personnel is collaborating with Baldwin in completion of design details. The steam turbine and electrical equipment are designed and will be built by the Westinghouse Electric & Manufacturing Company. The cab will be near the front end of the locomotive. The coal supply will be carried at the head end instead of in the tender, as at present. The boiler will take up the center section behind the engineman's cab. The steam turbine and electric generators, with a capacity of 4,000 kw., will be placed at the rear. Motors will be mounted on each of the driving axles.

The locomotives, according to a statement issued by Carl E. Newton, president of the C. & O., are being built for the specific purpose of powering separate sections of a projected new streamline train which will be constructed as soon as critical materials and manpower become available.

Army Releases Steel for 2,000 More Box Cars

A DIRECT transfer of carbon steel from the Army to the Office of Defense Transportation will enable the production of 2,000 additional new box cars in the first nine months of 1945, the O. D. T. has announced.

The Army has turned over 34,000 tons of carbon steel for the second quarter of 1945, the O. D. T. said, bringing the total box-car production for the first nine months of 1945 to the "desired goal" of 20,000.

Col. J. Monroe Johnson, O. D. T. director, said that the railroads have placed orders for all these new cars. He expects the cars to be in service by October, in time for the heavy grain movement due at that time. In addition, they will also place the railroads in a better position to handle the increased freight traffic to the west coast called for by huge shipments of war materials to the Pacific theater.

The action of the Army, Colonel Johnson said, indicates a recognition on its part of the importance of the box-car program as an essential feature of the war effort.

N. Y. C. 4-8-4 Locomotive — A Correction

THE 25 4-8-4 type locomotives which are on order with the American Locomotive Company for the New York Central will

Miscellaneous Publications

NORFOLK & WESTERN LOCOMOTIVES.—The Norfolk & Western has issued a plastic-bound booklet, with cover, in colors, descriptive of its modern coal-burning steam locomotives, "modern" being used to designate those locomotives with high-capacity boilers with roller bearings on all engine and tender wheels, one-piece cast-steel bed frames, improved counterbalancing, and complete mechanical and pressure lubrication. The locomotives described in the booklet are of three types: (1) a streamline passenger locomotive, Class J, with a 4-8-4 wheel arrangement; (2) a single-expansion articulated freight and heavy passenger locomotive, Class A, with a 2-6-6-4 wheel arrangement, and (3) a heavy Mallet compound freight locomotive, Class Y6, with a 2-8-8-2 wheel arrangement. Each of these types is illustrated and data are given on the performance, maintenance cost, fuel economy, and utilization.

have 79-in. wheels. Through a typographical error this dimension was given as 29 in. in the caption under the illustration on page 188 of the April *Railway Mechanical Engineer*. The locomotives are Class S-1.

Burlington Plans Glass-Domed Passenger Car

WORKING in conjunction with engineers and draftsmen of the General Motors Corporation, the Chicago, Burlington & Quincy, through its president, Ralph Budd, has announced plans for the construction of a new type of passenger car which will be featured by a dome made entirely of glass.

According to Mr. Budd sculptors, designers and artists of General Motors had conceived the idea of giving railroad passengers an entirely new and unobstructed view of the country through which they ride by designing a car "without any inhibitions or restrictions such as past railroad practices or standards." As a result a car has been produced which is provided with an upper level of seats and with glass domes of an unusual design.

According to present specifications, the floor of the middle section of the car will be slightly lower than in standard cars and will be roofed with a glass-enclosed dome. In addition to providing the two seat levels the car will add to the seating capacity. For experimental and demonstration purposes a standard car will be remodelled to conform with the new design.

Train Telephone for the C. of N. J.

THE Central of New Jersey is turning to train telephone to help improve coordination of switching movements in its busy Allentown, Pa., yard. A one-way inductive installation will be made in the yard office at the westbound hump and on locomotives working in that section of the yard. Radio also is being studied for possible

(Continued on second left-hand page)

Essential in Locomotive Boiler Design *... Ample Free Steam Area* *between Boiler and Cylinders*

Maximum free steam area
is obtainable only with the
Elesco superheater as ap-
plied to boilers with maxi-
mum evaporating surface.

Consult our Engineers when
you are considering new
power.



A-1643

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Montreal, Canada
THE SUPERHEATER COMPANY, LTD.

IT'S A GREAT NEW DAY FOR RAILROADING

100%
AVAILABILITY
on the
PANAMA LIMITED
and
CITY OF MIAMI



GENERAL MOTORS
LOCOMOTIVES

IT'S A GREAT NEW DAY FOR RAILROADING

During May, June
and July last year,
three General Motors
Diesel locomotives
operated at 100% availability
over 237,144 miles on these
two crack trains of the
Illinois Central.

Remarkable?

Yes, but not unusual
for GM Diesels.

ON TO FINAL VICTORY ★ BUY MORE WAR BONDS

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS CORPORATION

LA GRANGE, ILL.

Orders and Inquiries for New Equipment Placed Since the Closing of the April Issue

LOCOMOTIVE ORDERS			
Road	No. of locos	Type of loco.	Builder
Pere Marquette	10	1,000-hp. Diesel-electric	Electro-Motive
FREIGHT-CAR ORDERS			
Road	No. of cars	Type of car	Builder
Alton	500 ¹	Box	Pullman-Standard
Clinchfield	1,000	50-ton hopper	American Car & Fdy.
FREIGHT-CAR INQUIRIES			
Road	No. of cars	Type of car	Builder
Bangor & Aroostook	50-100	70-ton hopper	
	50-100	50-ton rack	
Canadian National	500	50-ton box	

¹ Authorized by Federal Judge John B. Barnes. Cost, \$1,675,000.

application at other points on the railroad.

The Jersey Central's first radio installation is one of a number of improvement projects on the railroad's 1945 capital expenditures budget. The projects include several new structures for employees, a new tower and a new interlocking installation at V.N. tower, just east of the Allentown yard, other signaling improvements at various points on the railroad, new machine tools and mechanized equipment for shop, storehouse and maintenance-of-way work, additional floodlight and loudspeaker

systems for the railroad's principal yards, and mechanical improvements at a number of specific locations.

Eksergian Receives Levy Medal

At Medal Day exercises at the Franklin Institute on Wednesday evening, April 18, Dr. Rupen Eksergian, chief consulting engineer of the Edward G. Budd Manufacturing Company, received the Louis Edward Levy gold medal which was founded in

1923 to be awarded to the authors of papers of especial merit published in the Journal of the Franklin Institute. Dr. Eksergian's paper was entitled "On the Reaction of Fluids and Fluid Jets" and appeared in the May, 1944, issue of the Journal. It includes a discussion of rocket propulsion and jet drive for airplanes, together with some phases of the reaction of jets.

A. S. M. E. Semi-Annual Meeting

THE semi-annual meeting of the American Society of Mechanical Engineers will be held at 11 a.m. on June 18 at the Stevens Hotel, Chicago. The meeting will be devoted solely to the report of the tellers on the ballot for changes in the Constitution which has now been distributed to the members of the Society.

Responsibilities of Foremen — A Correction

E. R. BATTLE, whose paper entitled "A Wide Range of Interests" appeared on page 147 of the April issue of the *Railway Mechanical Engineer*, is chief of motive power and car equipment of the Canadian National, not of the Canadian Pacific.

Supply Trade Notes

OHIO INJECTOR COMPANY.—Joe W. Greene has been appointed general sales manager of the Ohio Injector Company, Wadsworth, Ohio.

NATIONAL MALLEABLE & STEEL CASTINGS COMPANY.—At his own request, Henry F. Pope, chairman of the board of the National Malleable & Steel Castings Company since 1934, was not re-elected to that post at the



Henry F. Pope

annual meeting on March 28 and the office of chairman was left vacant. Mr. Pope, who will continue as a director, has been active in the company since he began as an office boy with its predecessor, the Cleveland Malleable Iron Company, in 1884, and has served in various capacities including those of assistant treasurer, vice-president and president. He has been a director since 1899. W. H. Moriarty, assistant to the



W. H. Moriarty

president responsible for the direction of general policies and coordination between the five plants of the company for all industrial sales, has been assigned the additional duties of assisting in the administration of the railway sales department.

Army-Navy E Awards

American Foundry & Equipment Company, Mishawaka, Ind. Third star.
Copperweld Steel Company, Glassport, Pa. Fourth award.
DeVilbiss Company, Toledo, Ohio. Fourth award.
Lodge & Shipley Machine Tool Co., Cincinnati, Ohio. Fifth renewal.
Pacific Car & Foundry Company, Billings, Mont.
United States Rubber Company, Passaic, N. J.

PITTSBURGH STEEL FOUNDRY CORPORATION.—D. P. Morgan has been appointed assistant sales manager, Philadelphia, Pa., district of the Pittsburgh Steel Foundry Corporation, Glassport, Pa. Mr. Morgan formerly was sales engineer of the Hanna Stoker Company, Cincinnati, Ohio, covering the railroad fields in the eastern and southern territories.

OXWELD RAILROAD SERVICE COMPANY.—Kenneth I. Thompson has been appointed eastern sales manager of the Oxweld Railroad Service Company, with headquarters



Kenneth I. Thompson

at New York. Previously Mr. Thompson was western sales manager of the railroad department of the Ingersoll-Rand Company. He was born at Bridgeport, Conn., on March 28, 1904, and is a graduate of the Staunton Military Academy, Staunton, Va. In 1921 he entered the railway supply field as a salesman in the employ of the Penn-

sylvania Pump & Compressor Company. A short time later Mr. Thompson went with the Fuller Lehigh Company and in 1937 he became associated with Ingersoll-Rand.

◆
PRECO INCORPORATED.—Preco Incorporated, has recently opened district offices at 135 South LaSalle Street, Chicago, and 70 East Forty-fifth street, New York. The branch office will be in charge of *Paul H. Montgomery* and *Horace M. Wigney*, respectively.

◆
H. K. PORTER COMPANY.—*S. B. Heppenstall, Jr.*, has been elected vice-president of the H. K. Porter Company, Pittsburgh,



S. B. Heppenstall, Jr.

Pa., with headquarters in the general offices in Pittsburgh. Mr. Heppenstall formerly was vice-president in charge of sales of the Heppenstall Company.

◆
WARNER & SWASEY COMPANY.—*A. H. Keetch* has been appointed head of the newly organized sales-service department of the Warner & Swasey Company, Cleveland, Ohio, after a two years' leave of absence on government service. In Washington, Mr. Keetch served as chief of the priorities and distribution branch, tools division, War Production Board.

◆
ENTERPRISE RAILWAY EQUIPMENT COMPANY.—*O. A. Wallace*, who recently resigned as superintendent of the car department of the Atlantic Coast Line, with headquarters at Wilmington, N. C., has been appointed sales engineer of the Enterprise Railway Equipment Company, Chicago.

◆
BOSS BOLT & NUT COMPANY.—*Milton Strauss* has been elected president and treasurer of the Boss Bolt & Nut Co., Chicago, a division of the Lock Nut Corporation of America. Mr. Strauss recently purchased the controlling interest in the company. *C. J. Johnson*, secretary since 1927, has been re-elected to that position and appointed assistant treasurer. *George S. Hubbard* has been elected vice-president, continuing also as sales manager. *Edward J. Guck* of Detroit, Mich., for a number of years a production specialist and operator of his own plants, has been appointed general manager in charge of production.

Railway Mechanical Engineer
MAY, 1945

◆
BUFFALO FORGE COMPANY.—*Charles C. Cheyney* has been appointed sales manager of the Buffalo Forge Company, Buffalo, N. Y. Mr. Cheyney was for a number of years Chicago representative of the company. In recent years he has been assistant sales manager.

◆
AMERICAN ROLLING MILL COMPANY.—*Harry Holiday* has resigned as manager of the Butler, Pa., division of the American Rolling Mill Company because of illness. *Gordon Gage*, general superintendent, succeeds Mr. Holiday, and *Roy P. Tooke*, assistant chief of the company's general engineering department in Middletown, Ohio, has been transferred to Butler as general superintendent.

◆
GALVIN MANUFACTURING CORPORATION.—*Edward L. Pincus*, formerly chief field expediter for the Philco Corporation, has been appointed district sales manager, middle Atlantic states, for the Galvin Manufacturing Corporation, with headquarters in Philadelphia, Pa.

◆
DEARBORN CHEMICAL COMPANY.—*George R. Carr*, whose election as chairman of the board of the Dearborn Chemical Company, Chicago, was reported in the April issue, was born at Argenta, Ill., on January 23, 1877, and is a graduate of the University of Illinois (1901). Two weeks after graduation he joined the staff of Dearborn as a salesman and served successively until 1922 as assistant general manager and gen-



George R. Carr

eral manager. In 1922 he was elected vice-president and general manager, and in February, 1944, chairman of the executive committee.

◆
PULLMAN-STANDARD CAR MANUFACTURING COMPANY.—*Henry G. MacDonald* has been appointed assistant vice-president of the Pullman-Standard Car Manufacturing Company, with headquarters in New York as heretofore. Mr. MacDonald is a graduate of Cornell University. He was with the Standard Steel Car Company from 1902 to 1930, rising from sales engineer to assistant to the vice-president. He was appointed assistant secretary of Pullman-Standard when that company was formed through the merger of the Standard Steel Car Company and the Pullman Car & Manufacturing Co., in 1930.

(Turn to second left-hand page)

◆
EATON MANUFACTURING COMPANY.—*E. D. Cowlin* has been appointed resident manager of the Reliance Division of the Eaton Manufacturing Company, Massillon, Ohio, assuming local supervision of manu-



E. D. Cowlin

facturing and sales operations as well as of all activities in connection with operations of the Reliance Division in Massillon. Mr. Cowlin was originally manager of the New York office. He is a past president of the National Railway Appliance Association, and holds memberships in the American Society of Mechanical Engineers, the American Railway Engineering Association, and the Canadian Railway Club.

◆
COOPER-BESSEMER CORPORATION.—*C. M. Bovard* has been appointed design engineer of the Cooper-Bessemer Corporation, Mount Vernon, Ohio. Mr. Bovard was previously chief draftsman.

◆
IRON & STEEL PRODUCTS, INC.—*David Newhall*, has been elected vice-president in charge of the New York district of Iron & Steel Products, Inc., Chicago, with headquarters at 780 Riverside Drive, New York. Mr. Newhall served the company in the same capacity several years ago.

◆
AMERICAN CAR AND FOUNDRY COMPANY.—*Frederick H. Norton* has been appointed assistant vice-president in the sales department with headquarters in New York. Mr. Norton attended the Morgan Park Military Academy, Chicago, from 1920 to 1924, and during this period worked part time for the Union Metal Products Company, now the Standard Railway Equipment Company. He later was employed by the Union Metal Products Company, first as office boy and then as draftsman, meanwhile attending night school and graduating in 1928. He is a graduate of Purdue University (1932) with a degree in mechanical engineering. He subsequently was employed as sales engineer by the A. L. Jackson Company and in 1934 became sales engineer in the Chicago office of the American Steel Foundries assigned to mid-western railroads. In May, 1940, he was appointed war production engineer and assigned to Washington, D. C., to handle all of the American Steel Foundries, activities with the government and foreign agencies.



The nearer we get the

Each stepping stone to Tokyo has been harder to take.

They said it couldn't come any worse than Guadalcanal. That even the nights were something you'd rather forget. Japs shrieking in the dark and rapping on trees and tossing rocks into foxholes—and now and then a grenade just to keep the boys guessing.

Then came Tarawa.

You heard how the landing boats got hung on a reef. How the boys had to wade in under cross-fire

from the enemy. They said Tarawa would go down as the worst.

Then came Iwo Jima.

They said, a mile offshore, in the barges, the sea boiled like vegetable soup from Jap shelling. It was full of chopped-up boats. They said the Japs' big guns were above and they just aimed down hill and let go. They said it cost us five times the price of Tarawa. They said Iwo was the worst.

Next?

Let's make 7 unlucky



e harder they fall !

vn
ea
ras
ins
go.
va.
Well—there's Chichi Jima, Haha Jima—fifteen islands to go. And then, of course, the ultimate objective—Japan itself.

You can help lower the price we'll have to pay—by buying War Bonds. Bonds to give our boys equipment to throw at the enemy. For the more *equipment* they can throw at them, the fewer *lives* they will have to give.

How much are *you* investing to help preserve American lives?

for the Japs!

7th WAR LOAN

Contributed by
Steam Division
of American Locomotive
Company

ELLIOTT COMPANY.—*W. A. Elliott*, vice-president in charge of sales of the Elliott Company, Jeannette, Pa., has been elected executive vice-president. *Ronald B. Smith*, manager of engineering research and development, has been elected vice-president in charge of engineering, and *M. G. Shevchick*, secretary, has been elected also treasurer. *F. W. Dohring*, general sales manager, has been given added responsibilities as assistant to the executive vice-president.

LIMA LOCOMOTIVE WORKS.—*Robert E. Briggs*, assistant shop engineer, has been appointed shop engineer of the Lima Locomotive Works, to succeed the late *W. N. McConkey*. *Ivan B. Wagner* has been appointed senior assistant shop engineer, and *Henry Wagner, Jr.*, assistant shop engineer.

Robert E. Briggs is a graduate of Ohio State University (1934). He formerly was employed in the Packard Electric division of the General Motors Corporation, Warren, Ohio, and was process engineer there when he resigned in 1937 to become industrial engineer at the Berger Manufacturing division of the Republic Steel Corporation, Canton, Ohio. He was appointed plant engineer in 1940. In 1942 he joined the Lima Locomotive Works as assistant shop engineer.

Ivan B. Wagner has been in the electrical department of the Lima Locomotive Works for the past 28 years and has been chief electrician for 19 years.

Henry Wagner, Jr., was in the employ of the American Locomotive Works at Pittsburgh, Pa., before joining the Lima shop engineering department 28 years ago.

PITTSBURGH STEEL FOUNDRY CORPORATION.—*G. D. Thompson*, chairman of the board of directors of the Pittsburgh Steel Foundry Corporation, Glassport, Pa., has



G. D. Thompson

been elected president of the company. Mr. Thompson has been a director of the company for the past six years. He was elected chairman in 1942. He attended the Carnegie Institute of Technology and was at one time production manager of the Westinghouse Electric & Manufacturing Company. Subsequently, he was president of the Thompson & Taylor Company and president of the 535 Fifth Avenue Corp.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.—*Ellis L. Spray* has been elected vice-president in charge of elevator and air conditioning activities of the Westinghouse Electric & Manufacturing Co., at Jersey City, N. J. The Westinghouse Electric Elevator Company, which was a wholly owned subsidiary of the Westinghouse Electric & Manufacturing Co., has been dissolved and will continue as the Elevator and Air Conditioning divisions of Westinghouse. Mr. Spray had been vice-president and general manager of the Elevator Company.

ALLIED RAILWAY EQUIPMENT COMPANY.—*Carl R. Moline*, whose election to vice-president of the Allied Railway Equipment Company, with headquarters at Chicago,



Carl R. Moline

as reported in the April *Railway Mechanical Engineer*, was born at Ft. Madison, Iowa, on April 23, 1910. He is a graduate of the University of Iowa, and became a design engineer in the employ of the Goss Printing Press Company at Chicago in 1937. In 1939 he went with the Ajax Hand Brake Company and in September, 1940, resigned to become associated with the Allied Railway Equipment Company. On January 1, 1942, he was appointed to chief engineer, in which position he also continues.

UNION ASBESTOS & RUBBER COMPANY.—*George A. Hull*, vice-president of the Union Asbestos & Rubber Co., and general manager of the firm's Equipment Specialties division, with headquarters at Chicago, has been transferred to Los Angeles, Calif., where he will supervise special work in engineering and sales of specialties for refrigerator cars and other railroad equipment. Mr. Hull will retain his titles and continue his previous duties.

STANDARD OIL COMPANY OF NEW JERSEY.—*Joseph F. Hoerner*, formerly New York district sales manager for the Baldwin Locomotive Works, has joined the railroad sales department of the Standard Oil Company of New Jersey.

BENDIX AVIATION CORPORATION.—The Bendix Radio division of the Bendix Aviation Corporation has expanded its west coast

quarters at North Hollywood, Calif., to provide complete shop facilities for the assembly and production of special equipment, mock-ups and experimental radio installations for aircraft, railroad, marine and other applications

PRESSED STEEL CAR COMPANY.—*Ernest Murphy*, vice-president in charge of operations, has been elected president of the Pressed Steel Car Company to succeed *John F. MacEnulty*, who becomes vice-chairman of the board of directors. The sales department will continue under the direct jurisdiction of Mr. MacEnulty.

FAFNIR BEARING COMPANY.—*Fayette Leister* has been appointed engineering manager of the Fafnir Bearing Company, New Britain, Conn. Mr. Leister joined the Fafnir staff in 1921 as a sales engineer and for the past 10 years has been manager of the Detroit, Mich., territory. As engineering manager he will have charge of all phases of product design and development, testing and research, engineering data and service engineering.

L. C. CHASE & CO.-GOODALL COMPANY.—*L. C. Chase & Co.* has been consolidated with the Goodall decorative fabrics division of the Goodall Company, to be known as Goodall Fabrics. The following appointments have been announced: *Paul E. Carr* has been appointed general manager. Mr. Carr joined L. C. Chase & Co. in 1940 as manager of the woolen division and for the past two years has been assistant general manager. *George B. Ogan* will continue with the company in a consulting capacity. *Jud E. Williams* has been appointed sales manager. Mr. Williams has been general manager of the Goodall decorative fabrics division since 1940.

GENERAL ELECTRIC COMPANY.—*T. F. Barton*, commercial vice-president of the General Electric Company, has announced several organization changes within the New York district. *G. H. Reid* has been appointed assistant district manager. *W. E. Brown* has relinquished his position as manager, Central Station division, but will remain to handle special assignments. *H. M. Sliter* has been appointed district manager. *Horace Zimmer* district manager, Transportation Division, has been appointed also district manager of the Industrial division. *H. M. Bardin* is manager of sales of the Federal and Marine section which has been transferred from the Transportation to the Industrial division. *R. B. Ranson* has been appointed manager of the New Haven, Conn., office, and *J. J. Pascher* will manage the Hartford, Conn., office. *R. M. Darrin* has been appointed district manager, transportation division, New York district.

HARRINGTON-WILSON-BROWN COMPANY.—*David F. Robinson*, recently granted inactive status from his assignment as lieutenant commander in the Navy Department, has joined Harrington-Wilson-Brown Company, with headquarters in New York. Prior to entering the service, Mr. Robinson had been associated for 13 years with William Sellers & Co., Philadelphia, Pa.

CLIMAX MOLYBDENUM COMPANY.—*R. L. Heath*, formerly chief metallurgist of the Allison division of the General Motors Corporation at Indianapolis, Ind., has been appointed metallurgical engineer of the Climax Molybdenum Company, with headquarters in St. Louis, Mo.

CHAMBERSBURG ENGINEERING COMPANY.—*Commander R. E. W. Harrison* has rejoined the Chambersburg Engineering Company as vice-president in charge of sales, following his release to inactive duty by the Secretary of the Navy after four years of service as a staff officer in various bureaus and offices of the Navy Department.

AMERICAN WELDING COMPANY.—The Carbondale, Pa., plant of the American Welding Company, wholly owned subsidiary of the American Car and Foundry Company has been closed and is now being offered for sale.

RANSOME MACHINERY COMPANY.—*Carl F. Oechsle* has been appointed vice-president in charge of sales of the Ransome Machinery Company of Dunellen, N. J., a subsidiary of the Worthington Pump and Machinery Corporation.

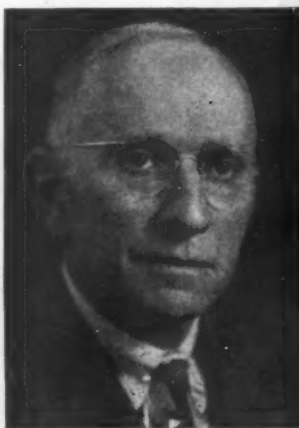
SYMINGTON - GOULD CORPORATION.—The Overland Supply Company, 116 New Montgomery Street, San Francisco, Calif., has been appointed sales representative of the Symington-Gould Corporation.

AMERICAN BRAKE SHOE COMPANY.—*T. W. Pettus*, executive vice-president, has been appointed president of the National

Bearing division of the American Brake Shoe Company.

Obituary

GARTH GRIFFITH GILPIN, vice-president in charge of engineering of the Standard Railway Equipment Manufacturing Company, Chicago, whose death on February 25 was announced in the April *Railway*



Garth C. Gilpin

Mechanical Engineer, was born at Portland, Ind., on October 3, 1882. He was a graduate of Purdue University with a degree in mechanical engineering. Mr. Gilpin spent two years in mining engineering and then became a draftsman, serving first the Wisconsin Central and later the Pennsylvania. In 1910 he became chief draftsman for the Chicago, Burlington & Quincy. He resigned in 1918 to join the staff of the W. H.

Miner Company as a sales engineer and later became associated with the Standard Railway Equipment Manufacturing Company as chief engineer. In 1917 he was appointed vice-president in charge of engineering. Mr. Gilpin invented many devices for railway cars. His death occurred while vacationing in Arizona.

ALEXANDER TURNER, vice-chairman and director of the National Bearing Metals Corporation, died March 20. Mr. Turner was 77 years of age. He was in the employ of the Wisconsin Central from 1886 to 1899, as a locomotive fireman, traveling fireman, locomotive engineman and road foreman of engines. From 1899 to 1909 he was with the Galena Signal Oil Company; from 1913 to 1927 was vice-president of the Bronze Metal Company, and in 1927 was elected vice-chairman and director of the National Bearing Metals Corporation.

ROBERT C. MCCLOY, southeastern sales manager of the Taylor-Wharton Iron & Steel Co., died March 8. Mr. McCloy, who was 74 years of age, had been in charge of the company's Philadelphia, Pa., office where he maintained his headquarters. He had been associated with Taylor-Wharton in various sales capacities for 58 years.

BENJAMIN NIELDS, assistant vice-president of the National Malleable & Steel Castings Company, died February 26. Mr. Nields was 63 years of age. He was in charge of the company's New York sales office from 1909 to 1931, when he returned to Cleveland, Ohio, as assistant vice-president.

Personal Mention

General

C. R. RUSH, master mechanic of the Missouri Pacific at DeQuincy, La., has been appointed mechanical superintendent of the Southern district, with headquarters at St. Louis, Mo.

J. M. NIXON, general foreman of the Seaboard Air Line's shops at Wildwood, Fla., has been appointed superintendent, motive power, of the Macon, Dublin & Savannah, with headquarters at Macon, Ga.

C. P. SLACK, formerly electrical foreman of the Delaware, Lackawanna and Western at Scranton, Pa., has been appointed division electrical supervisor, covering all electrical work done on the railroad in the state of Pennsylvania. Mr. Slack will continue to make his headquarters in Scranton.

EDWARD C. KAISER, whose appointment as superintendent of motive power of the Lehigh & New England at Pen Argyl, Pa., was announced in the April issue, was born at Philadelphia, Pa., on January 20, 1899.

Mr. Kaiser entered railroading in July, 1917, with the Reading. After holding various supervisory positions he became general foreman of the Reading's engine terminal at Philadelphia, the position he held at the time of his appointment as superintendent of motive power of the Lehigh & New England.

In Military Service

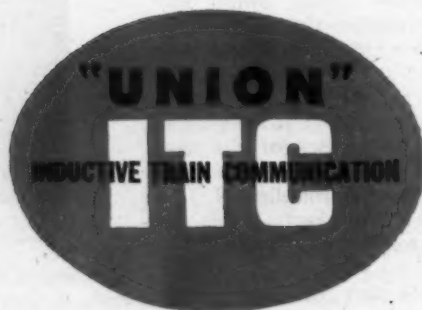
LT. COL. FAY L. KING, of Sabula, Ia., formerly district master mechanic of the Chicago, Milwaukee, St. Paul & Pacific, has been promoted to the rank of Colonel as announced by Maj. Gen. Frank S. Ross, chief of transportation, European Theater of Operations. Colonel King is in charge of the equipment division, 2nd Military Railway Service.

ANDREW HOPKINS, formerly assistant enginehouse foreman of the Chesapeake & Ohio at Hinton, W. Va., is now with Company B, 770th Railway Operating Battalion at Camp Claiborne, La., and is conducting air-brake classes for the road- and shop-men in that unit.

ROBERT R. SNEDDON, who has been appointed assistant superintendent equipment of the New York Central at Detroit, Mich., as noted in the April issue, was born on May 5, 1903, at Evansville, Ind. Mr. Sneddon is a graduate of the Mt. Carmel (Ill.) High School (1922). He became a machinist apprentice in the locomotive shops of the Cleveland, Cincinnati, Chicago & St. Louis (New York Central) at Mt. Carmel, on October 16, 1922; enginehouse and car foreman at Benton Harbor, Mich., on August 19, 1929; gang foreman at Indianapolis, Ind., on August 1, 1930; enginehouse foreman at Lafayette, Ind., on November 3, 1932; gang foreman at Indianapolis on January 1, 1933; special inspector at Indianapolis on July 1, 1933; gang foreman at Indianapolis on February 2, 1936; enginehouse foreman at Riverside shops, Cincinnati, Ohio, on October 1, 1937; and general foreman at Riverside on October 1, 1939. Mr. Sneddon was appointed assistant master mechanic at Detroit on July 1, 1941; master mechanic at Jackson, Mich., on November 1, 1942; assistant to superintendent equipment on September 1, 1943, and assistant superintendent equipment on January 1, 1945.

Let's get *down to earth*

on train communication



Dependable voice communication

"Union" I.T.C. (Inductive Train Communication) system provides dependable, practicable two-way voice communication between vehicles of a train, between trains, and between trains and wayside points.

It is a train communication system designed exclusively for railroad use, by men who know railroad needs, and proved through years of regular railroad service.

If your railroad has *rails*

"Union" Inductive Train Communication is a system of voice communication *designed exclusively for railroad use*. It utilizes for transmission two elements commonly found on railroads—the tracks and the adjacent line wires.

At wayside stations, the frequency-modulated wave is transmitted and received over direct connections to tracks and line wires. Vehicles transmit and receive inductively.

Thus, installations of "Union" I.T.C.

equipment involve no new structures. It's a job that existing departments can handle with a minimum of outside supervision. If your railroad has rails and a pole line, you're well on your way toward easy installation of "Union" I.T.C.

Ease of installation is one more reason why railroads interested in dependable train communication are finding that "*Union*" I.T.C. is the answer.

Full information will be furnished without obligation by our nearest district office.

UNION SWITCH & SIGNAL COMPANY

SWISSVALE

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ST. LOUIS

SAN FRANCISCO

C. L. HALL has been appointed assistant supervisor of Diesel locomotive maintenance of the New York Central, with headquarters at New York.

Car Department

F. C. FYE, assistant engineer car construction of the Union Pacific at Omaha, Neb., has been advanced to the position of general car inspector, northwestern district and Idaho division to and including Pocatello, with headquarters at Pocatello, Idaho.

RALPH Q. WILLIAMS, car foreman of the Union Pacific at Nampa, Idaho, has been promoted to the position of general car inspector, south-central district, with headquarters at Salt Lake City, Utah.

Master Mechanics and Road Foremen

ORA O. STERNE has been appointed road foreman of engines of the Baltimore & Ohio, with jurisdiction over the territory between Grafton, W. Va., Richwood and Charleston. Mr. Sterne's headquarters are at Grafton.

L. M. CORNELL, general foreman of the Atlantic Coast Line at High Springs, Fla., has been appointed acting master mechanic at Waycross, Ga., replacing T. B. Dobbins, who has been granted a leave of absence on account of illness.

Shop and Enginehouse

F. L. HENIG, general foreman, locomotive department, of the Missouri Pacific at Little Rock, Ark., has been appointed acting superintendent of shops, with headquarters at Little Rock.

A. HUBENER, superintendent of shops of the Missouri Pacific, with headquarters at Little Rock, Ark., has been granted a leave of absence because of illness.

Obituary

HARRY W. RIDGWAY, who retired in 1936 as superintendent of motive power of the Colorado & Southern, died in a Denver, Colo., hospital on March 17. Mr. Ridgway was born at Delaware Water Gap, Pa., on July 17, 1866, and entered railway service in November, 1881, as a mechanical apprentice on the Denver & Rio Grande Western. He served in various capacities in the mechanical department of this company and of the Mexican Central until 1901 when he was appointed superintendent of machinery of the El Paso & Northeastern (now part of the Southern Pacific). Later he was appointed superintendent of the contract shop. In 1904 he returned to the Mexican Central as superintendent of shops at Agua Caliente, Mex., and from 1906 to 1913 served as master mechanic on the Colorado & Southern and the Atchison, Topeka & Santa Fe at Denver. At the end of this period he was appointed superintendent of motive power of the C. & S. From 1924 to 1932 Mr. Ridgway also served as assistant to the superintendent of motive power of the Chicago, Burlington & Quincy.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

"BETTER PRODUCTS WITH ELECTRIC WELDED TUBING."—Formed Steel Tube Institute, Keith building, Cleveland 15, Ohio. A 32-page book compiled to bring to engineers and product designers a new conception of electric welded tubing. Contains specifications for various tubing applications and illustrations both of wartime and peacetime uses.

MICRO SWITCHES.—Micro Switch Division, Freeport, Ill. 100-page illustrated catalog, No. 71. Describes, by sections, Micro switches with A-N part numbers, basic Micro switches, die cast and aluminum housings, peanut Micro switches and auxiliary actuators.

ENGINEERING DATA.—Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio. Engineering bulletin M-1322 contains dimensional drawings and specifications of their several types of milling and broaching machines. Photographs of the machines uniformly placed on the pages serve as a visual index to the data. Included also are data and drawings of several attachments used with these machines.

AIR DIFFUSION.—W. B. Connor Engineering Corp., New York, 74-page catalog, "Kno-Draft Adjustable Air Diffusers." Essentially an engineering handbook showing the sketches, charts, instructive tests and dimension prints to furnish the engineering data necessary for the proper application and performance of air diffusers.

ELASTIC STOP NUT CORPORATION.—John R. Munn, chairman of Munn & Steele, Inc., has been elected president of the Elastic Stop Nut Corporation to succeed W. T. Hedlund, who died November 29. Mr. Munn, who was a director of Elastic Stop Nut, will serve for the unexpired term of his predecessor and until his successor is elected.

FLOATLESS LIQUID LEVEL CONTROLS.—The B/W Controller Corporation, Birmingham, Mich. Twenty-eight-page illustrated catalog No. 145 covering floatless liquid level and industrial controls. The floatless controls employ fixed electrodes in the liquid and are featured as being free from troubles caused by ice.

SCREW THREAD FITS.—Greenfield Tap and Die Corporation, Greenfield, Mass. "Guide to Screw Thread Fits" presents in concise and graphic form essential data on screw thread fits. Each size of screw thread—NC and NF sizes from No. 3 machine screw through 1 in.—is covered on a single page.

"QUALITY CONTROL" HANDBOOK.—Continental Machines, Inc., 1301 Washington avenue South, Minneapolis 4, Minn. A pocket size book on scientific inspection

through controls offered by DoAll gages and gage instruments, with photographs, diagrams, charts and conversion tables.

BUSHING PRESSES.—Watson-Stillman Company, Roselle, N. J. Bulletin 520-A descriptive of a line of self-contained, quick-acting, oil-operated presses for inserting and removing connecting-rod bushings, driving-box brasses, etc., and for bending or straightening rods, levers, etc.

WELDING EQUIPMENT.—The Victor Equipment Company, San Francisco, Calif. 104-page catalog of Victor gas-welding and cutting equipment. Data cover various types of welding and cutting torches, cutting attachments, cylinder manifolds, regulators, etc. One page carries a welding torch, tip and nozzle selection chart which shows the tip size, flame length, pressures and hourly gas consumption required for various metal thicknesses.

SEAM AND ROLL SPOT WELDING MACHINES.—Sciaky Bros., 4915 West Sixty-Seventh Street, Chicago. Bulletin No. 113-A illustrates and describes Series P.M.M. 180 KVA seam and roll spot welding machines for mild steels, stainless steels, and non-ferrous alloys. Contains also tooling data and machine specifications.

MACHINE GAS CUTTING TIPS.—Air Reduction Sales Company, 60 East Forty-second street, New York 17. Twelve-page, four-color bulletin, No. ADG-2008, describes Airco "45" and "45M" high-speed machine gas cutting tips which control the expansion of cutting oxygen. Illustrated with cross-sectional drawings and photographs.

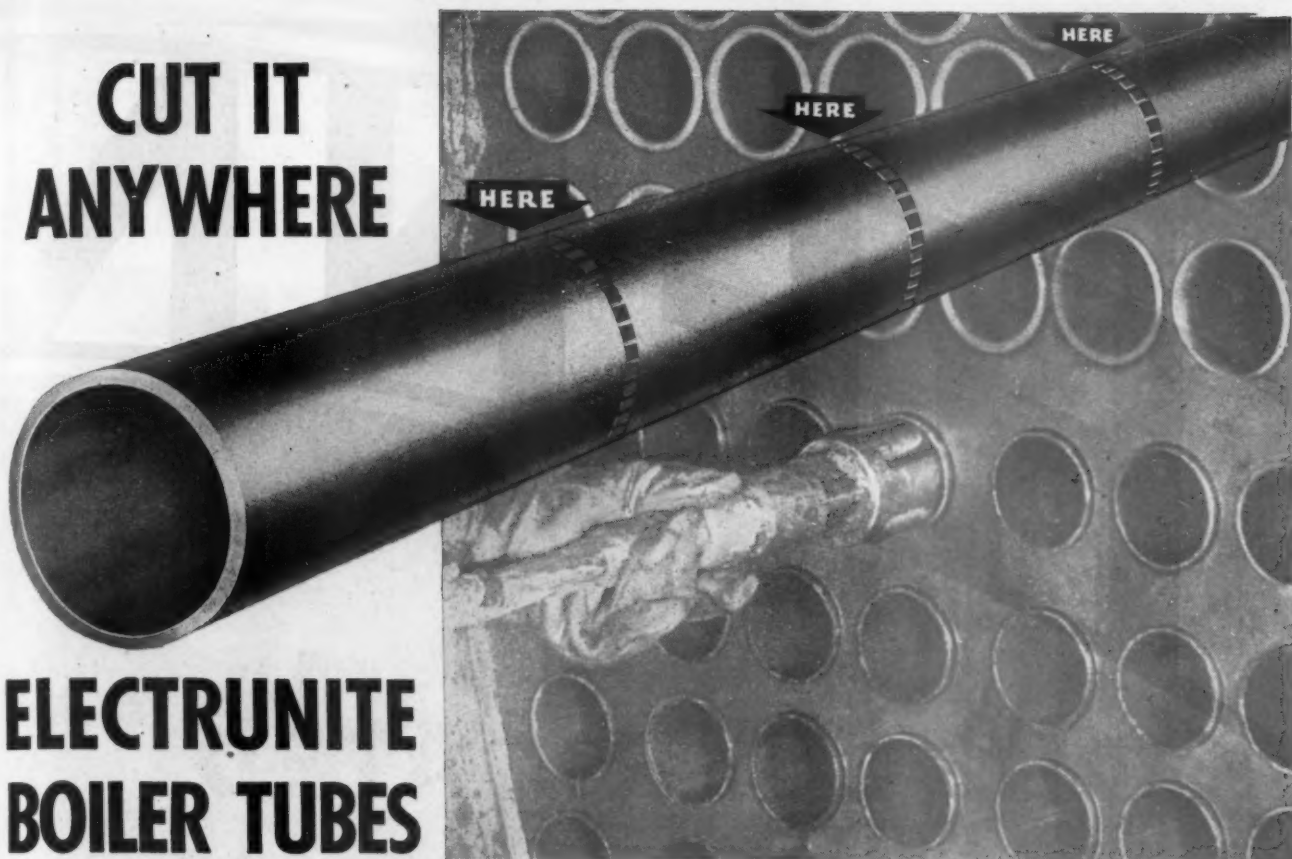
CUTTING TOOLS.—Chicago-Latrobe Twist Drill Works, 411 West Ontario Street, Chicago 10. Six-page leaflet entitled "Cutting Tools for Efficient Operations." Gives information as to range of sizes and the adaptability of various types of Chicago-Latrobe drills.

VARNISHES.—Dow Corning Corporation, P. O. Box 592, Midland, Mich. Eight-page booklet describes the properties of DC 993 varnish and outlines the recommended procedure in applying this silicone product to the insulation of electrical equipment.

MAGNETO IGNITION CATECHISM.—Fairbanks, Morse & Co., Beloit Works, Beloit, Wis. A 64-page illustrated book devoted to the subject of fundamentals of magneto ignition. Contents include such subjects as definition of magneto, its general purposes, magnetism and electricity, ignition requirements, early ignition systems, magneto design and construction, application of magneto ignition, impulse couplings and their use, and magneto service practices.

CUT IT ANYWHERE

ELECTRUNITE BOILER TUBES



Always Roll in Easily

● It's a fact—you can cut an ELECTRUNITE Boiler Tube at any point, and the cut ends will roll in just as easily as the original ends. Yet Republic's practice of full normalizing the *entire length* of every tube is just one of the features which save time and money for ELECTRUNITE users.

These *modern* tubes are consistently UNIFORM in diameter, wall thickness and concentricity—due to Republic's improved electric resistance welding process.

They slide through tube sheet holes freely, roller expand and bead over to smooth, non-leaking joints easily and quickly. Rare, indeed, is the occasion when "weepers" are found in pressure testing a completed ELECTRUNITE installation.

Every ELECTRUNITE tube must pass a rigid testing routine, both during and after fabrication—including hydrostatic testing at pressures in excess of code requirements—offering you positive assurance that

each tube is uniformly sound and strong throughout. There's no need to worry about valve-clogging scale or corrosion-inviting scale pits, either. ELECTRUNITE Boiler Tubes are made from highest quality, flat-rolled steel, carefully inspected on both sides before processing.

Proof of ELECTRUNITE acceptance is found in the fact that more than 150,000,000 feet have been installed in all types of stationary, railroad and marine boilers, and in other steam generating and heat transfer equipment throughout industry.

Write for the new brochure on boiler, heat exchanger and condenser tubes!

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Export Department: Chrysler Building, New York 17 New York



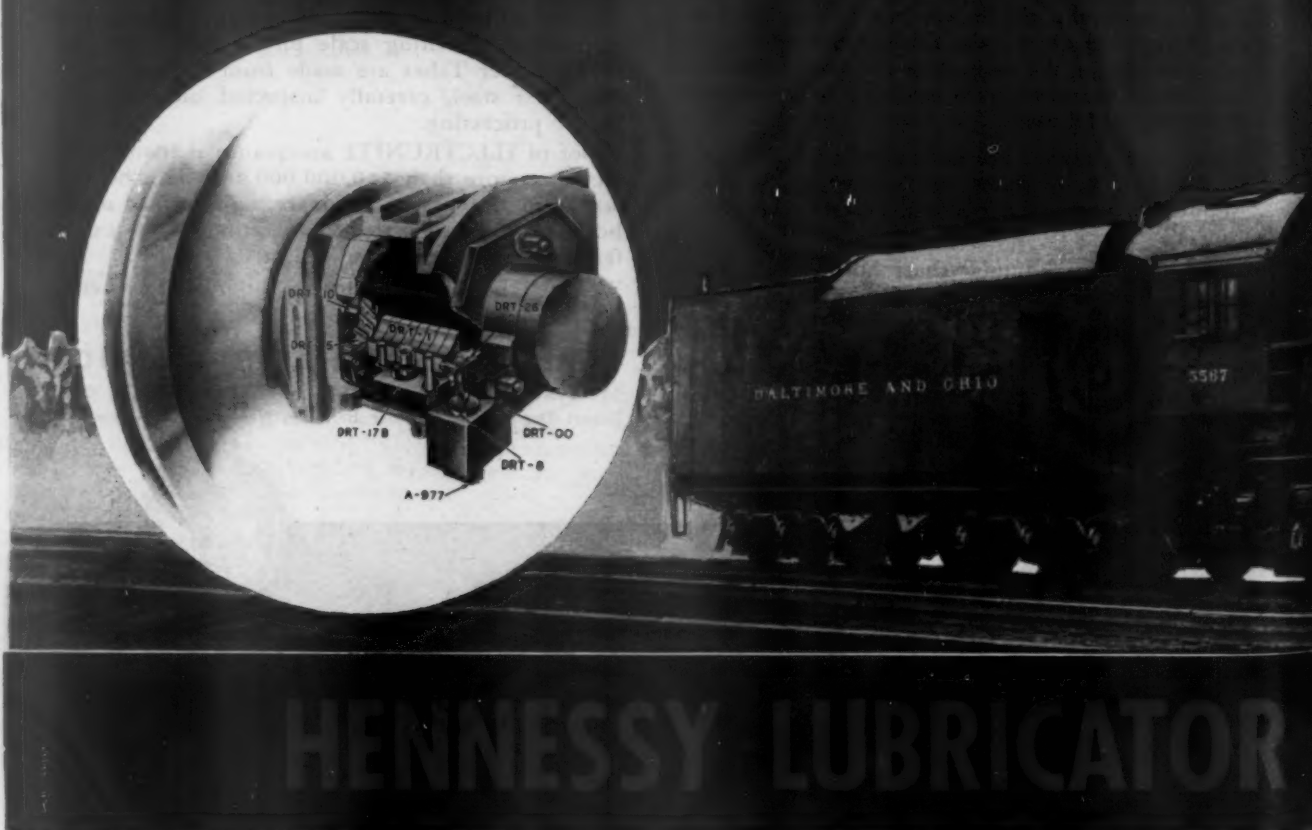
Republic

ELECTRUNITE

BOILER, CONDENSER AND HEAT EXCHANGER TUBES

HENN

OIL LUBRICATED DRIVING JOURNAL PERFORMANCE

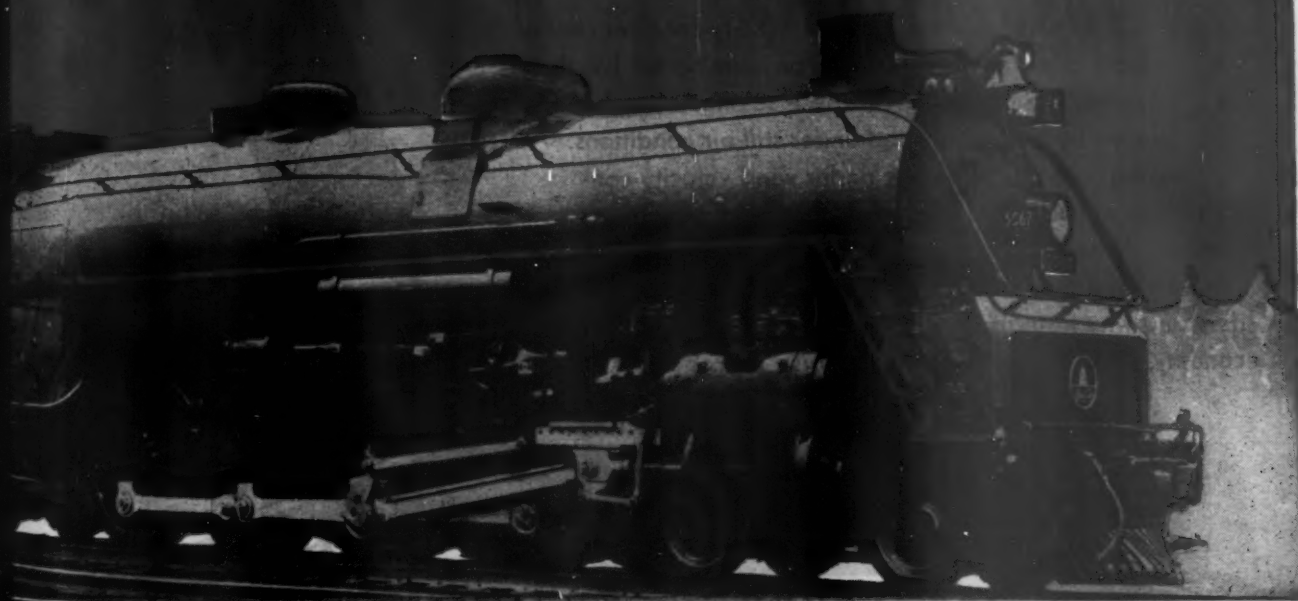


HENNESSY LUBRICATOR

HENNESSY

A group of 19 of these engines, fully equipped with Hennessy Mechanical Lubricators on lead truck, driver, trailer and tender journals, is making outstanding records in fast freight service. Some of these locomotives have made in excess of 300,000 miles without having any repairs made to driving boxes or journals.

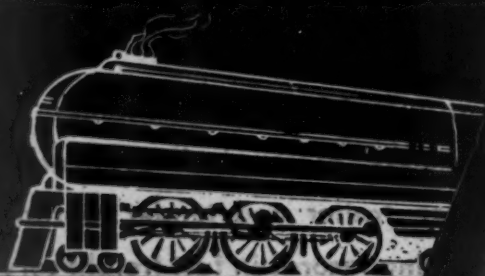
Performance of this kind is very exceptional and savings resulting are certainly worth while.



CO., Inc.

75 WEST STREET
NEW YORK 6, N. Y.

IF YOU CHECK YOUR RECORDS
REGARDING INSULATION THIS IS
WHAT YOU WILL PROBABLY FIND



**SAVE MORE FUEL
WITH INSUTAPE PIPE
INSULATION**

Sixty-four per cent of bare pipe heat losses can be eliminated by the application of Insutape! These savings have been proven by tests conducted under still air conditions. Savings are much greater under wind velocity conditions encountered in actual operation of rolling stock! When coupled with the fact that Insutape can be used over and over again, it is easy to understand why Insutape is a standard of quality and economy on a majority of the nation's railroads.



**UNION ASBESTOS
MEANS PROGRESS IN INSULATION
AND RUBBER CO.**

TWO WAYS TO SAVE MONEY

and increase passenger comfort too

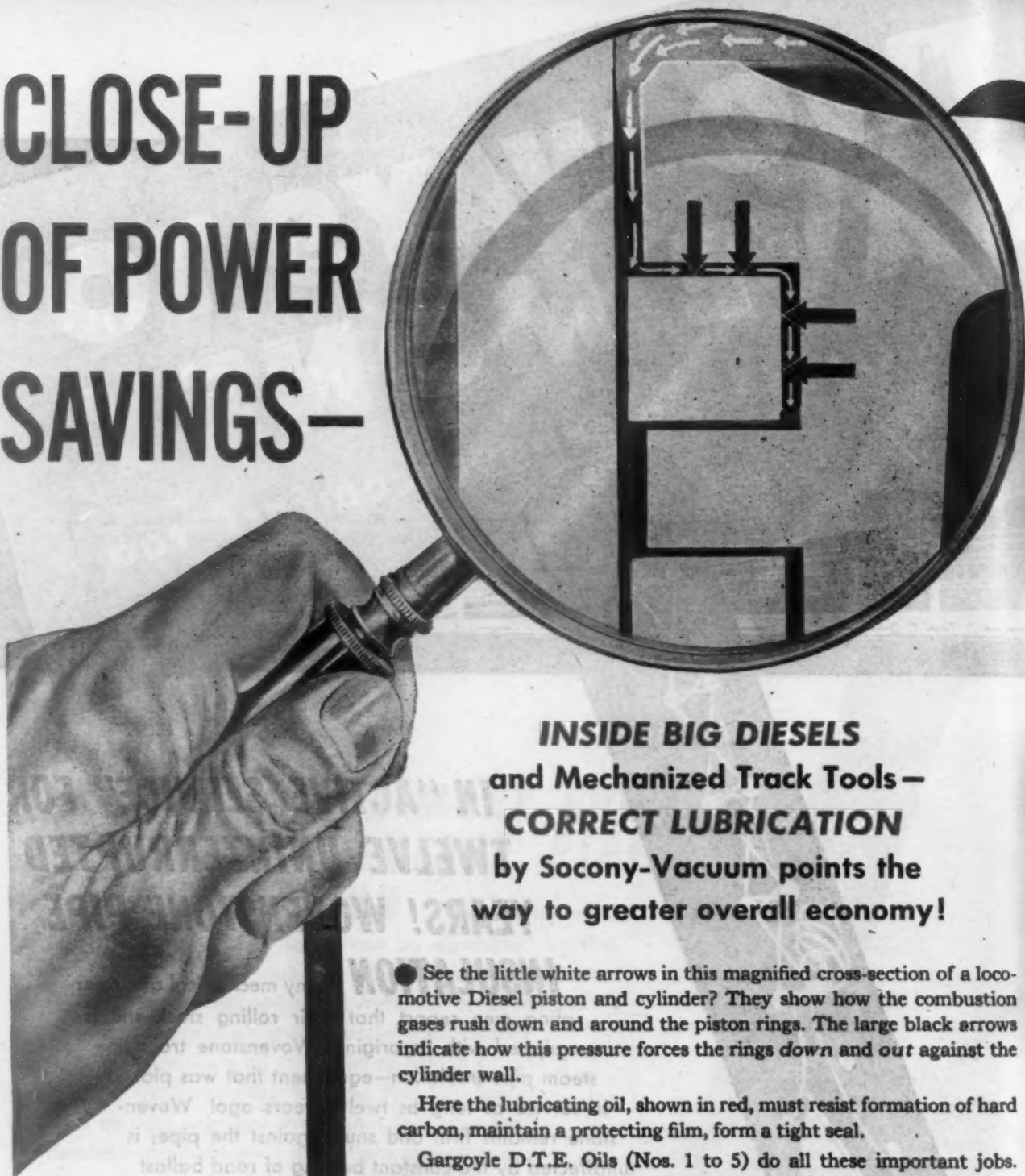
IN "ACTIVE SERVICE" FOR TWELVE UNINTERRUPTED YEARS! WOVENSTONE PIPE

INSULATION

Many mechanical and operating men report that their rolling stock still is equipped with its original Wovenstone train line steam pipe insulation—equipment that was placed in service as long as twelve years ago! Wovenstone remains firm and snug against the pipe; is unaffected by the constant beating of road ballast on its surface; will not loosen, sag or shake down. It can be removed and reapplied over and over again without loss of original efficiency. That's why Wovenstone is a standard of quality and economy on a majority of the nation's railroads.

310 S. MICHIGAN AVENUE
CHICAGO 4, ILLINOIS

CLOSE-UP OF POWER SAVINGS—



INSIDE BIG DIESELS and Mechanized Track Tools — CORRECT LUBRICATION by Socony-Vacuum points the way to greater overall economy!

● See the little white arrows in this magnified cross-section of a locomotive Diesel piston and cylinder? They show how the combustion gases rush down and around the piston rings. The large black arrows indicate how this pressure forces the rings down and out against the cylinder wall.

Here the lubricating oil, shown in red, must resist formation of hard carbon, maintain a protecting film, form a tight seal.

Gargoyle D.T.E. Oils (Nos. 1 to 5) do all these important jobs. Despite intense heat and pressure, their strong films resist rupture and assure full piston seal...their high chemical stability resists formation of hard carbon deposits, and deposits which do form are soft and fluffy.

These quality oils are also assuring top power savings in large stationary and marine Diesels throughout the world.

You'll get similar savings of power in your high-speed, automotive-type Diesels with Delvac 900 Series Oil.

Call your Socony-Vacuum Representative *today!*

SOCONY-VACUUM OIL CO., INC.

Standard Oil of N.Y. Div.
White Star Div. • Lubrite
Div. • Chicago Div. • White
Eagle Div. • Wadhams Div.
Magnolia Petroleum Co.
General Petroleum Corp. of
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CONTINUOUS FULL POWER FROM MAINTENANCE EQUIPMENT

●Two basic requirements for continuous, smooth operation of every track tool are (1) the right oil or grease, (2) applied in the right place, in the right way.

Working closely with manufacturers of maintenance-of-way equipment, Socony-Vacuum has developed lubricants exactly right for all tools and their motors.

Your Socony-Vacuum Representative will gladly specify the ones best suited for your track tools, and assist you in their correct application.

AIR TOOLS. Specially developed oils by Socony-Vacuum resist the washing action of water... protect vital moving parts against wear and rusting... assure more continuous hours of operation, less time out for repair.



HEAVY EQUIPMENT. You get greater protection for engines, transmissions, heavy exposed gears... fewer lay-ups for overhaul of big cranes and other heavy equipment with the properly recommended Socony-Vacuum oils and greases.



TRACTORS. In engines, special Socony-Vacuum oils give best protection against wear... help keep rings, valves and bearings *clean*... reduce overall operating costs. For chassis fittings, special greases seal out dirt, grit, water.



IT PAYS TO KNOW WHAT'S NEW IN LUBRICATION

SOCONY-VACUUM

OIL COMPANY, INC.

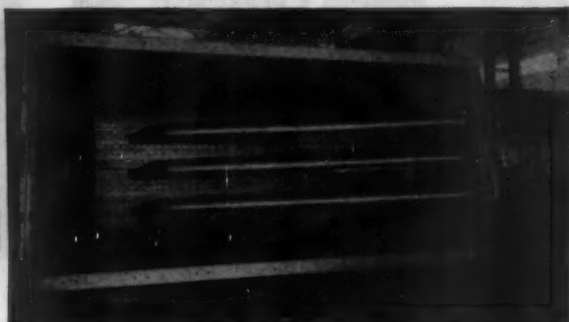
TUNE IN "INFORMATION PLEASE"—MONDAY EVENINGS, 9:30 E.W.T.—NBC

20 new B & O "GOLIATHS" built with strong innards of National Seamless



No. 7600—One of 20 new 2-8-8-4 type articulated locomotives built by Baldwin for the B. & O. Ten more are now on order. Boiler tubes and super-heater pipes are NATIONAL Seamless.

Huge firebox, 228 inches long, is a feature of this boiler. Five thermic syphons, with the lower connecting pipes made of NATIONAL Seamless are installed, three in the firebox and two in the combustion chamber.



THESE HUGE new locomotives were built to haul fast, heavy freights over the Allegheny Mountains. On the 17-mile stretch from Piedmont to Altamont, W. Va. they negotiate a maximum grade of 2.2 per cent west-bound.

The new locomotives have a rated tractive force of 115,000 pounds and the average driving axle load of about 60,600 pounds. The flue length is 20 ft. 6 in. and the minimum gas area through the flues and tubes is 11.20 sq. ft.

This is another case where NATIONAL Seamless Tubes make a good job better. Why? Because these tubes are completely annealed... easy to set, expand, roll, and bend. Strength is carefully balanced with ductility to obtain maximum service with ease of fabrication.

NATIONAL Seamless Tubes are pierced from solid billets of steel (Walls Without Welds)—no longitudinal weld—no long line of potential weakness. They are made from completely killed, i.e., thoroughly deoxidized steel and therefore have better creep properties at high temperatures, while the uniform density, freedom from laminations, and sound metal structure of deoxidized steel provide superior heat transfer characteristics. Where cinder cutting is severe, NATIONAL heavy-ended tubes have proved to be the answer.

Bulletin is available on request.



NATIONAL TUBE COMPANY

Pittsburgh, Pa.

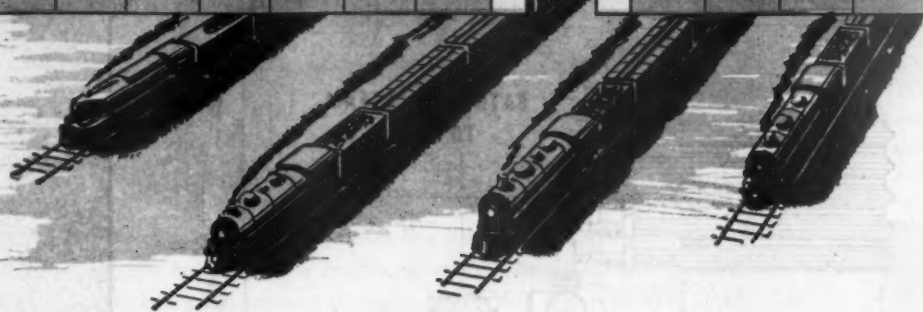
Columbia Steel Company, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York



UNITED STATES STEEL

MILEAGE UP!

MAINTENANCE DOWN

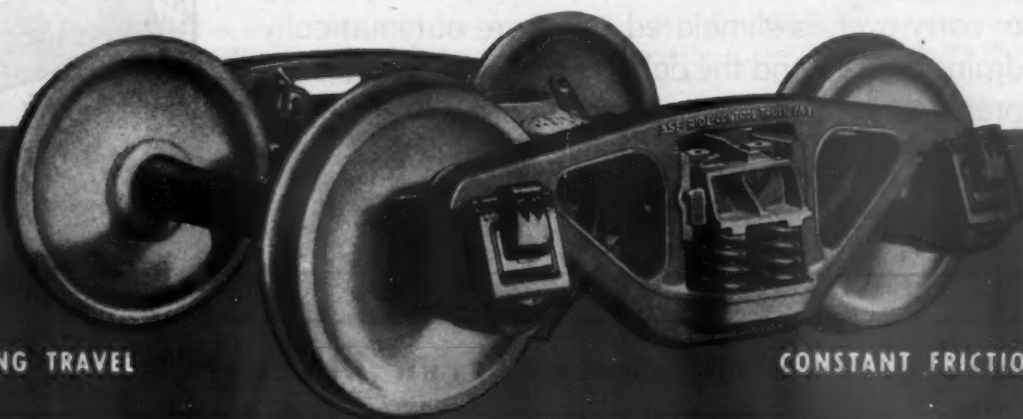


Ride-Control!

Rely upon the A. S. F. Ride-Control Truck (A-3) for an easy freight-car ride at any speed and dependability in all types of service. A simple assem-

bly, without spring plates or spring planks, the Ride-Control Truck keeps more freight cars moving, more of the time, with minimum maintenance cost.

THE TRUCK FOR TODAY'S NEED . . . TOMORROW'S SPEED!



LONG SPRING TRAVEL

CONSTANT FRICTION CONTROL

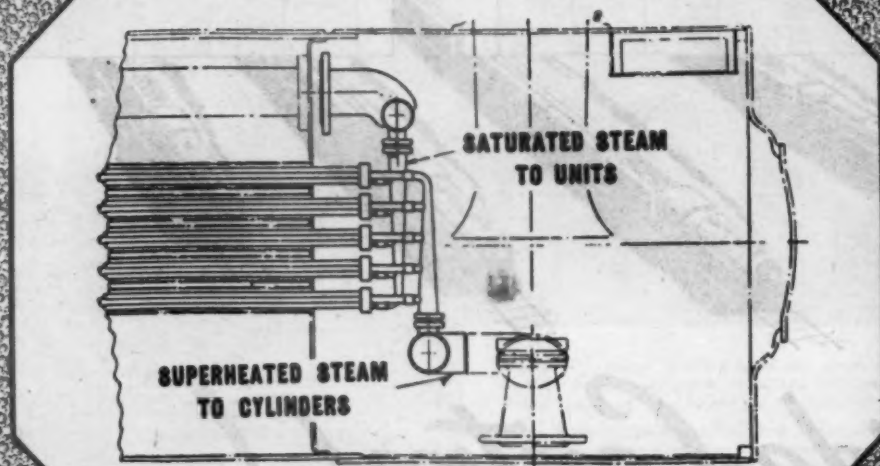
AMERICAN STEEL FOUNDRIES

CHICAGO

MINT-MARK OF  RIDE-CONTROL STEEL

SUPERHEATING *By Coffin*

PRESENTS



A System That Is
Substantially
Self-Draining

The accumulation of scale deposits due to priming or carry-over, is eliminated, units are automatically drained clean, and the delivery of maximum working pressure to the cylinders is assured.

THE J. S. COFFIN, JR., COMPANY
ENGLEWOOD, NEW JERSEY



PLEASE SEND C-S SUPERHEATER BULLETIN

NAME _____

COMPANY _____

ADDRESS _____

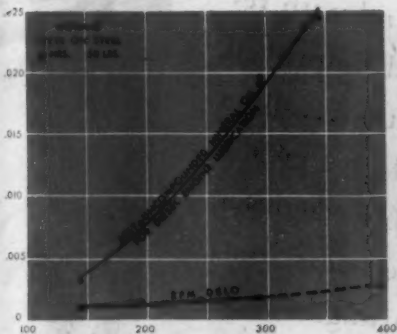
How RPM DELO Oil reduces engine wear

NEW PISTON RING

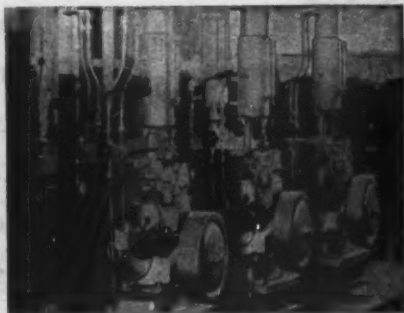
SCRATCHING WITH UNCOMPOUNDED MINERAL OIL

RING USED WITH RPM DELO OIL

The actual photographs above, in which the lines are merely emphasized by printing in red, are typical of the results obtained when testing RPM DELO Diesel Engine Lubricating Oil against ordinary Diesel oils. Because RPM DELO Oil contains a patented metal-adhering compound, it clings to hot cylinder spots that other oils leave dry, protecting rings and liners against excessive wear.

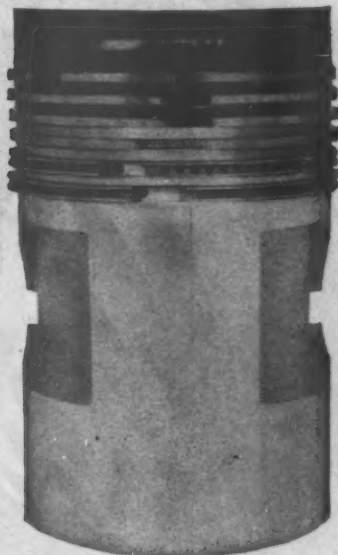


Confirming actual tests in engines are such laboratory tests as this with a Kinetic Oiliness Testing machine. RPM DELO Oil has far lower wear rate than the best uncompounded oil.

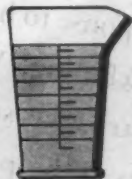


Here is a battery of special test engines in California Research Corporation's laboratories. They are used to determine the anti-ring-sticking properties of oils.

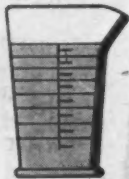
Here is a piston used in a special break-in test with straight mineral oil. This actual photo, with scratches emphasized in red, shows how rings, lands and skirt are badly scratched.



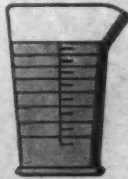
This piston went through the same test as the one above—but with RPM DELO Oil. No scratching occurred and every ring is free. RPM DELO Oil's film prevents scratching and scoring.



Detergent compound to clean engine.



Anti-oxidant to prevent gum and sludge.



Wear-reducing compound.



STANDARD OF CALIFORNIA

RPM DELO Oil has world-wide distribution, marketed under following names: RPM DELO, Caltex RPM DELO, Kyso RPM DELO, Signal RPM DELO, Sohio RPM DELO, Imperial RPM DELO (CONCENTRATE)

For more technical information about this revolutionary Diesel Engine lubricating oil, write to Standard of California, 225 Bush St., San Francisco 20, California, or California Commercial Co., 30 Rockefeller Plaza, New York 20, N. Y.



NICKEL IMPROVES PERFORMANCE...

Going hand-in-hand with revised design and improved methods of fabrication... alloys containing Nickel give greater play to the skill of the engineer. Nickel fortifies steels, cast irons, bronzes... imparting strength, hardness, toughness, and resistance to wear, shock, fatigue and corrosion. Nickel in the metal improves response to heat-treating and machining. Whatever your industry, we solicit the opportunity to help you with counsel and data.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET
NEW YORK 5, N. Y.

Tomorrow's
POWER
Today!



It's the
**Opposed-Piston
Diesel Locomotive**
by

FAIRBANKS-MORSE

A name worth remembering



HOLLOW
Flexible
STAYBOLTS
on

New York Central's
New NIAGARA

FLANNERY BOLT COMPANY
★
BRIDGEVILLE
PENNSYLVANIA



CAST ARMOR



ROLLS ON TO

VICTORY!

**United States Army Medium Tanks Built
with CAST ARMOR HULLS and TURRETS**



ONE-PIECE ARMOR CASTINGS are tough and strong and their high ballistic values and streamlined contours provide the highest protection for our tank crews. We of **GENERAL STEEL CASTINGS CORPORATION** take pride in our part in the development and production of these and other armor steel castings.

Our many years of experience in the development of special purpose cast steels and in the designing and production of **COMMONWEALTH ONE-PIECE CAST STEEL DEVICES** has served well. War-time advances in the design and production of steel castings will be available to peace-time industry after **VICTORY**.

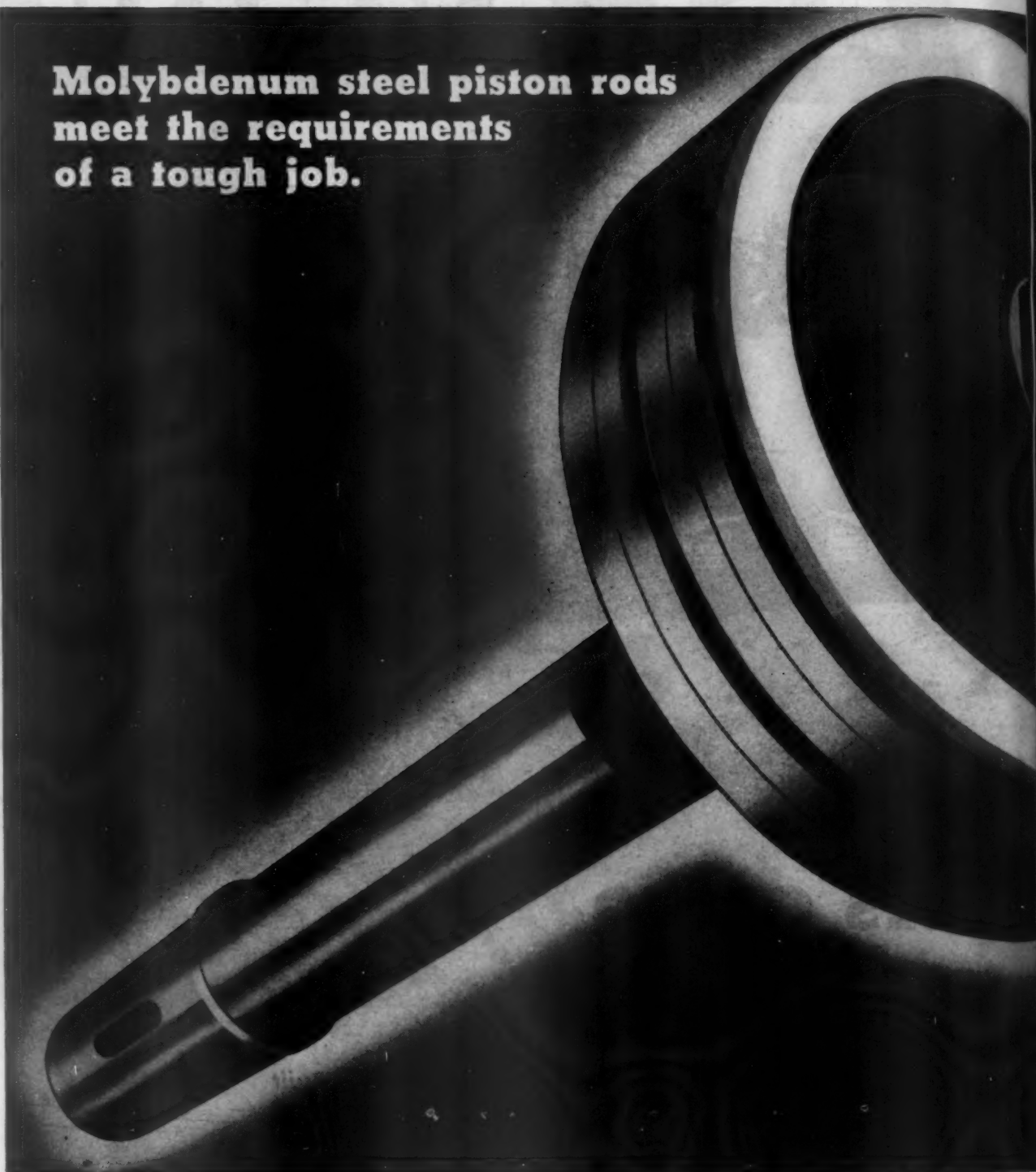


GENERAL STEEL CASTINGS

EDDYSTONE, PA. • GRANITE CITY, ILL.



**Molybdenum steel piston rods
meet the requirements
of a tough job.**



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING
DATA ON MOLYBDENUM APPLICATIONS.



MOLYBDIC OXIDE, BRIQUETTED OR CANNED •
FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company
500 Fifth Avenue • New York City



Marquette
PINS AND
BUSHINGS

★ **NITRALLOY AND HARDENED STEEL**



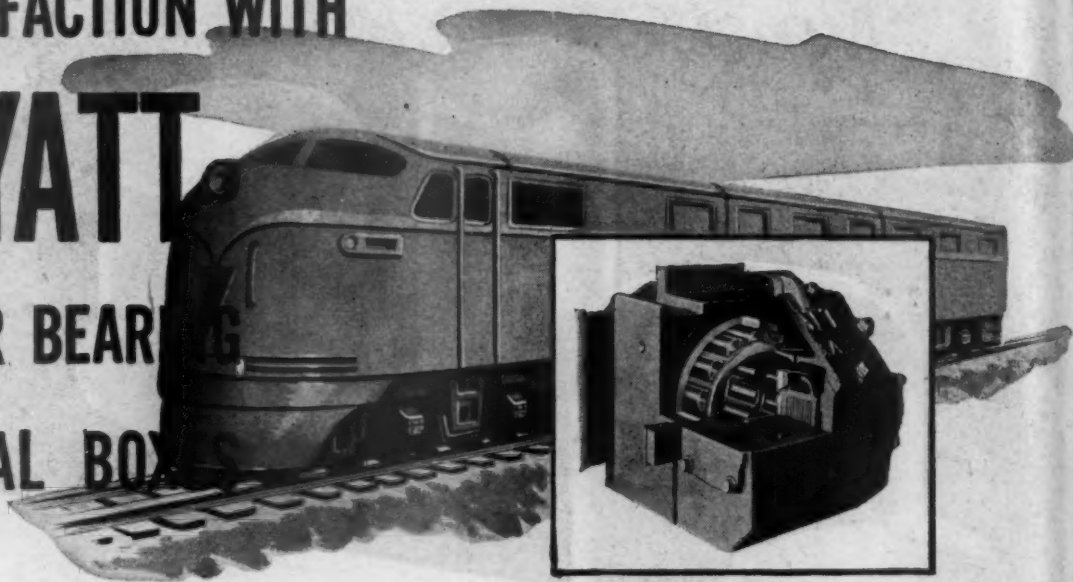
The **Marquette** **METAL PRODUCTS CO.**
CLEVELAND 10, OHIO

Manufacturers of: HYDRAULIC AND ELECTRIC WINDSHIELD WIPERS FOR AIRCRAFT
HYDRAULIC GOVERNORS FOR DIESEL ENGINES • ROLLER BEARING TEXTILE SPINDLES • FUEL OIL PUMPS
AIR COMPRESSORS • PRECISION PARTS AND ASSEMBLIES

OVER 200,000,000 MILES
OF SATISFACTION WITH

HYATT

ROLLER BEARING
JOURNAL BOX



Cutaway view of Hyatt Journal Box as used on Modern General Motors Diesel locomotives.

**ON 1100 DIESEL LOCOMOTIVE UNITS—
ON 30 RAILROADS
IN PASSENGER AND FREIGHT SERVICE**

This mileage is the aggregate of more than 1100 Diesel locomotive units to date and it is interesting to note that over half these two hundred million miles were made on less than 100 units—many of these having over one million miles each. ☆ This proves the dependability and outstanding performance of Hyatt Roller Bearings under the heavy, high speed, Diesel locomotive requirements. ☆ Similar satisfaction for your equipment is insured, as Hyatt equipped journal boxes are standard on all General Motors freight and passenger road engines.

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION

HARRISON, NEW JERSEY

CHICAGO

DETROIT

PITTSBURGH

OAKLAND, CALIFORNIA



FOR RESISTANCE TO ABRASION
... NO OTHER MATERIAL CAN EQUAL
ALLOY STEELS

● When locomotive parts like that above, or any machine parts with bearing surfaces, slide back and forth, or turn 'round and 'round, there's bound to be abrasion. And abrasion means wear, unless the parts that slide and turn are hard enough to resist abrasion.

When it comes to hardenability, no other material can equal alloy steels. That's why so many vital operating parts in all kinds of equipment are made of these finest of steels.

Alloy steels can be surface hardened or deep hardened to predetermined degrees of hardness with greater assurance of results than any other material. Their uniform response to hardening insures against non-hardened areas or soft spots in wearing surfaces.

But that's only one advantage of using alloy steels. Their high strength-to-weight ratio permits the use with safety of lighter equipment and smaller sections. Their super-toughness provides protection against severe shocks, reversal of stresses or sudden overloading. Their resistance to fatigue, heat, cold and corrosion means long life and lower costs for equipment in which they are used.

Would you like to know what alloy steels can do for you? Republic—world's leader in this branch of steel making—is ready to tell you whenever you're ready to listen.

REPUBLIC STEEL CORPORATION

Alloy Steel Division • Massillon, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO

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Republic
ALLOY STEELS

Also Carbon and Stainless Steels—Sheets—Plates—Pipe—Upson Bolts, Nuts and Rivets—Electricity Boiler Tubes

YOUR LOCOMOTIVE BOILER SHELLS CAN LOOK

Like This

AFTER FLUE REMOVALS

Unretouched photograph of interior of
sandblasted and APEXORIZED locomotive
boiler shell interior



**APEXORIZED METAL
SURFACES STAY
CLEAN LONGER ...
WEAR LONGER ...
WASH MORE EASILY**

Now . . . there's no need for you to tie up locomotives and manpower for difficult cleaning of boiler shells, flues and firebox sheets. A protective surfacing of APEXIOR NUMBER 1 . . . only about .0025" thick . . . cuts down the clinging power of dirt and scale so that they accumulate more slowly and come off more easily.

Records of five years of service experience on steam locomotive boiler interiors show that brush-applied, corrosion-proof APEXIOR not only reduces cleaning time but also retards or checks corrosion and pitting of boiler surfaces. That's because it penetrates pores and joints to prevent water from touching the metal. Moreover, it doesn't affect heat transmission.

APEXIOR SIMPLIFIES WORK OF WATER SERVICE DEPARTMENT

APEXIOR NUMBER 1 is not a substitute for

feed-water preparation or chemical treatment . . . but a supplement to the work of the chemist and water service engineer. By increasing the durability and raising the surface quality of boiler metal, it fortifies the metal in service under boiler water and steam temperatures and pressures.

APEXIOR surfacing also guards stay bolts and other water contact areas against the hazard of embrittlement or accelerated stress corrosion.

APEXIOR NUMBER 3 FOR TENDER CISTERNS

APEXIOR NUMBER 3 protects the interior of locomotive tender cisterns. Brush-applied cold, it dries to a smooth, shiny jet-black. It resists all boiler-water-treating chemicals and corrosion-proofs surfaces in contact with potable water.

APEXIOR ALWAYS AVAILABLE

Both APEXIOR surfacing materials are being shipped every day to industrial power plants, utilities, marine users and railroads throughout the country.

Write today for bulletin describing how APEXIOR saves metal, time and money.

Keeps new metal new

APEXIOR

Gives old metal new life

THE DAMPNEY COMPANY OF AMERICA

HYDE PARK 36, BOSTON
MASSACHUSETTS

ATLANTA

CHICAGO

NEW YORK

DETROIT

PHILADELPHIA



HIGHBALL!

5363

—with 4000 stubborn tons tied to her tail—and N-B-M Bearings to bear the brunt of the load.

Nothing but the best can stand up long under this strain. For trouble-free long-run economy, standardize on

N • B • M
JOURNAL BEARINGS
AND ENGINE CASTINGS



NATIONAL BEARING

D I V I S I O N

ST. LOUIS • NEW YORK



PLANTS IN: ST. LOUIS, MO. • PITTSBURGH, PA. • MEADVILLE, PA. • JERSEY CITY, N. J. • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

May, 1945

105

1,102,939 Non-Shop Miles *with* Union Pacific's 9-M-1A



WHEN big Diesel "9-M-1A" recently completed 1,102,939 miles in 53 months without a major overhaul, Union Pacific operating efficiency and maintenance were entitled to take a new bow. Another achievement had been added to Union Pacific's previous record-breaking non-shop Diesel runs.

Outstanding maintenance implies adequate lubrication. "9-M-1A" made

its mileage record on Sinclair Gascon G. L. Diesel Oil, one of the Sinclair lubricants used by Union Pacific.

Sinclair Gascon has natural detergent and anti-oxidant properties promoting clean engine operation, also wear-prevention qualities that hold down expensive maintenance and replacement outlays. Its efficiency has been proven in service on 35 leading railroads.

SINCLAIR RAILROAD LUBRICANTS

SINCLAIR REFINING COMPANY, RAILWAY SALES, NEW YORK • CHICAGO • SAINT LOUIS • HOUSTON

NO. 8 OF A SERIES ILLUSTRATING THE EVOLUTION OF AMERICAN LOCOMOTIVES



1881—SHAW'S 4-CYLINDER BALANCED ENGINE

The H. F. Shaw, built by the Hinkley Locomotive Works in 1881, had four cylinders and was publicized as being entirely free from the pounding and oscillating action of two-cylindered engines.

The cylinders were arranged side by side, transmitting the power to crank pins diametrically opposite each other. One of the crank pins connected outside the driving wheel at the same position an ordinary crank pin would be located, and carried a double crank, which was supported in a bearing secured in an outside frame. The bearing was the driving fulcrum, a main rod working at each side of it.

The engine was equivalent to one with two cylinders 16" x 24" and driving wheels 63" in diameter. The weight in working order was 74,000 pounds, of which 25,600 pounds was on the truck wheels.

From "IRON HORSES" ... W. W. NORTON & CO., INC.

"ENTIRELY FREE FROM POUNDING"

Four cylinders, two cylinders or turbine—any locomotive develops smoother power with . . .

UNION WEB SPOKE DRIVING WHEEL CENTERS

- ★ Cruciform section spokes for great additional strength.
- ★ Reinforced rim support to eliminate flat spots, out of roundness, etc.
- ★ Correct distribution of metal for better balancing of smaller diameter wheels.
- ★ Wheels easily inspected before and after installation.
- ★ Troubles due to shrinkage eliminated by simplicity of design.
- ★ Can be made to any material specification.



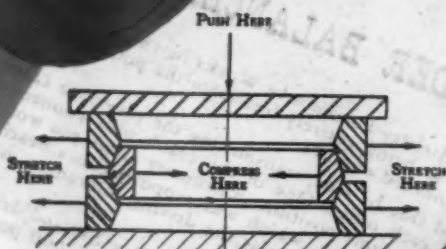
UNION STEEL CASTINGS

DIVISION OF
BLAW-KNOX CO.
PITTSBURGH, PA.



6 plants of
Blaw-Knox Company
have been awarded
the Army-Navy "E"
for excellence

Edgewater



PRINCIPLE OF THE RING SPRING



CHICAGO
MILWAUKEE
ST. PAUL
AND PACIFIC

EDGEWATER STEEL COMPANY · PITTSBURGH, PA.

water

DRAFT GEARS

SIMPLICITY

through EDGEWATER'S exclusive
RING SPRING PRINCIPLE

THE Edgewater B-32-KA Draft Gear is "packaged protection". The husky ring spring, lubricated for life, is enclosed in a sturdy pressed steel housing. The complete gear, with automatic length restriction device for ease of installation, is ready to slip into the pocket of your cars.


The exclusive ring spring principle also insures long life, high capacity, smooth action, and positive release. These qualities of Edgewater Draft Gears are fully demonstrated by A.A.R. sponsored tests.



Modern 50-ton box car built in December 1944 by the Milwaukee Road in its own shops.

Atlanta, Ga. Baltimore, Md. Boston, Mass. Chicago, Ill. Cleveland, O. Kansas City, Mo. Louisville, Ky. New York, N.Y.
Philadelphia, Penna. St. Louis, Mo. St. Paul, Minn. San Francisco, Calif. Seattle, Wash. Washington, D. C.

SUPERIOR 3-WAY FLUE ROLLER

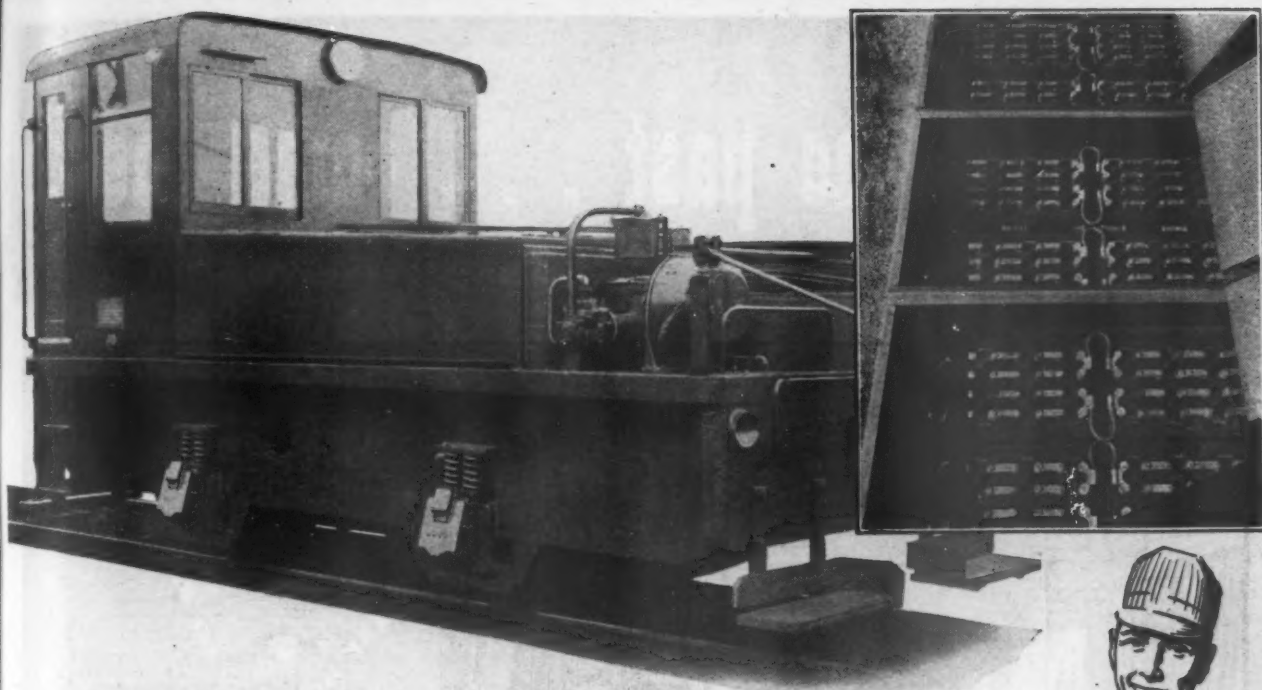


**Cuts "down-time"
for Flue Rolling
80 per cent**

**One Operation—
Expands
Prossers
Flares**

American railroads are doing a job today that would have been impossible a few years ago. Improved shop practice is one reason. Modern economic devices like the Superior 3-Way Flue Roller are reducing "down-time" and enabling locomotives to stay on the road for longer runs and heavier loads. The 3-Way Flue Roller not only saves time, it does a better job. — Prevents flues from becoming distorted, eliminates fire cracking in the fire box end, and avoids the hazard of flying chips. Available for prompt shipment.

SUPERIOR RAILWAY PRODUCTS CORP.
7501 Thomas Boulevard, Pittsburgh, Penna.

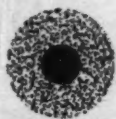


They chose A BATTERY WITH 20 years of experience!



KATHANODE GRID

Double wedge design of grid members gives strength and resistance to peroxidization.



BLACK OXIDE

Unique cores of pure lead give this positive active material unusually long life.



SPUN GLASS MATS

Of exclusive Gould design, these mats are 90% porous yet positively hold active material in place.

When Gould began the manufacture of Kathanode Glassklad batteries in 1925, the use of spun glass mat retainers was a radical battery innovation. Today it is acknowledged to be the best method for retaining active material in the positive plate.

Behind each Gould Kathanode battery of today are 20 years of service in every field where

storage batteries must meet daily cycle demands. It has proved itself time and again to be a better battery... efficient in operation and capable of meeting current needs in excess of rated capacity.

That's why a large midwest utility company chose Gould Kathanode to power its electric locomotive pictured here.

There is a Gould Kathanode that will do a better job for you. Write today for Catalog 100 on Gould Kathanode Glassklad Batteries for Industrial Truck and Tractor Service.

GOULD



SINCE 1898... THE BATTERY PICKED BY ENGINEERS

FOR EXCELLENCE IN STORAGE BATTERY PRODUCTION AT DEPEW PLANT

out of the past . . . come the



POSTWAR PASSENGERS WILL PATRONIZE CARRIERS THAT OFFER THE MAXIMUM COMFORT, SERVICE, SPEED AND SAFETY.

Modernize with

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Modern conveniences of today

WESTINGHOUSE RAILROAD WATER COOLERS...a necessity for passenger comfort

Postwar passengers will expect and demand the utmost in travel comfort and convenience. Railroad executives, fully aware of the severe competition of the future . . . are planning modernization of equipment and improved service to secure a full share of passenger traffic and revenue.

One of the most important comfort requirements is an adequate supply of pure, fresh, cold drinking water. The new Westinghouse Railroad Water Cooler is the answer . . . and is the result of years of experience in designing and building various types of water coolers.

The combined ideas of fifteen leading railroads were incorporated in this new custom-built cooler. For maximum efficiency and reliability include Westinghouse Railroad Water Coolers in your plans. Ask your Westinghouse Office for details and specifications.



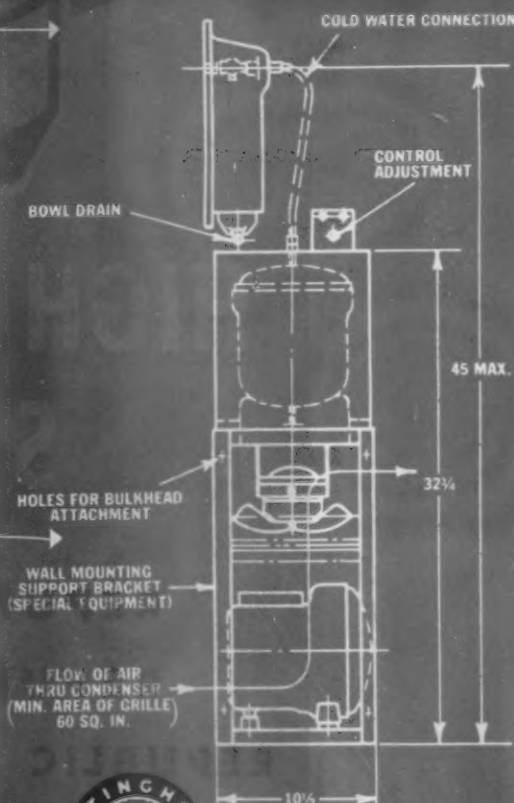
MODERN DESIGN, RUGGED CONSTRUCTION, FEATURES OF WESTINGHOUSE ELECTRIC DRINKING WATER COOLERS

1. **HERMETICALLY-SEALED** at the factory. After mounting the unit, only water and electrical connections need be made. No shafts, belts, pulleys or expansion valves to get out of order.
2. **CONVENIENT MOUNTING**—unit is compact and can be mounted either on the floor or wall in a concealed location. Easily and quickly installed. Spigot and bowl assembly are installed separately from the unit.
3. **CAPACITY**—ample cooling facilities provide 4 gals. of water per hour cooled from an inlet temperature of 80° F. to 50° F. drinking water temperature at 90° room temperature.
4. **LUBRICATION**—a permanently sealed-in oil supply, splash system for the compressor with the fan permanently oiled.

CONSULT WESTINGHOUSE

—on your plans for passenger car modernization. Available are axle-driven generators and control for high-speed operation; compressor motor and control; fluorescent lighting equipment; Precipitron for electrostatic air cleaning of cars; water coolers; "De-ion" circuit breakers; and other equipment for efficient car operation. Westinghouse Electric & Manufacturing Co., P. O. Box 868, Pittsburgh 30, Pa. J-95099

RAILROAD ELECTRICAL EQUIPMENT



Republic
offers you

3

**HIGH STRENGTH
STEELS**



REPUBLIC ALDECOR

REPUBLIC COR-TEN

REPUBLIC DOUBLE STRENGTH

Other Republic Products include Carbon, Alloy and Stainless Steels . . . Bars, Plates, Sheets, Strip,

NOW, from ONE source of supply, you can obtain THREE different low-alloy High Strength Steels—ALDECOR, COR-TEN and REPUBLIC DOUBLE STRENGTH.

All three steels are similar in their performance as low-cost weight-saving materials, but slight variations may make one more suitable than the others for certain applications.

Thus, Republic, in line with its policy of always providing industry with a COMPLETE range of steels, offers you all THREE from which you may select the most efficient and economical analysis for your particular requirements.

COR-TEN and DOUBLE STRENGTH

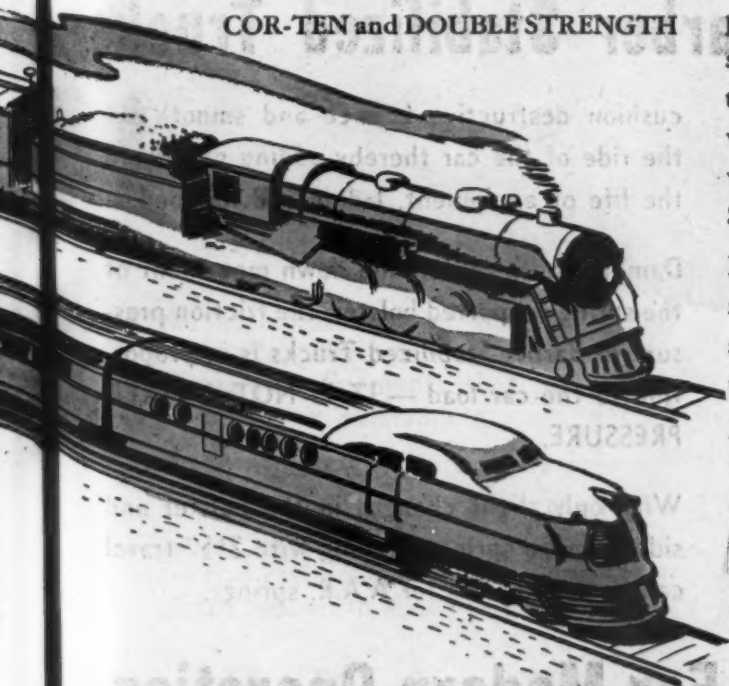
STEELS already have demonstrated their ability to *cut excess weight* from railroad equipment *in safety* and *at low cost*. ALDECOR, the newest of the three, promises to equal its companions and possibly surpass them in certain types of use.

All three steels are produced in bars, plates, sheets and strip. All three show a minimum yield strength of 50,000 pounds per square inch. And all three resist atmospheric corrosion—resist abrasion as well as carbon steels of equal physicals—and are easy to work and weld.

When you design and build freight and passenger equipment, your plans as to size and shape, load-carrying capacity, the type of service and other details will indicate the specifications which will determine the Republic High Strength Steel to use.

Republic metallurgical engineers are ready to work with your staff NOW in studying your needs and in selecting the steel which will mean greatest pay-load, lowest operating costs, highest efficiency and cheapest maintenance expense for you tomorrow.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Bldg., New York 17, N. Y.

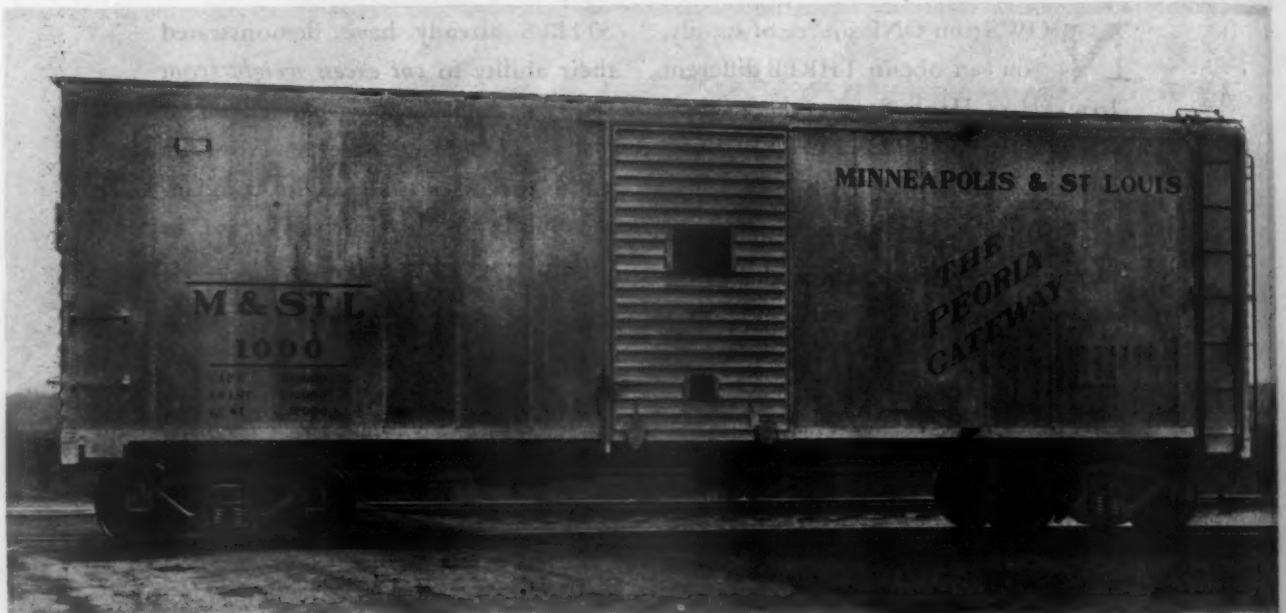


HIGH STRENGTH STEELS

ALDECOR • COR-TEN • DOUBLE STRENGTH

Bolts and Nuts, Rivets, Wire, Boiler Tubes, Mechanical Tubing, Fabricated Steel Products

Modern Trucks for



Barber Stabilized Trucks

Selected for over 92,000
cars by 55 different
Railroads and Private
Car Lines.

cushion destructive bounce and smooth-out the ride of the car thereby adding greatly to the life of equipment, lading and roadbed.

Damping both the up and down movement of the spring supported bolster, the friction pressure of Barber Stabilized Trucks is in proportion to the car load — IT IS NOT A FIXED PRESSURE.

With only slight changes in the bolster and side frame, a spring grouping with 2½" travel can be substituted for A.A.R. springs.

For Modern Operation

STANDARD CAR

332 S. MICHIGAN AVENUE

High-Speed Freight Cars

Barber Swing Hanger Trucks



are the up-to-date answer for high-speed freight service. Here are some of the soundly engineered refinements that make this truck's operation outstanding:

1. Load carrying springs directly over oil boxes.
2. Spring action controlled by contact of friction castings on hardened steel wear plates applied to inside of pedestals.
3. Swing hangers carried directly by side frames.
4. No heavy, expensive transom required.
5. An easy ride is assured because shocks are absorbed by frictional device at journal box.

Specify Barber Trucks

TRUCK COMPANY

CHICAGO 4, ILLINOIS

Tension there in
spite of wear.....

TENACITY

(to hold strongly)

Locomotive
Hy-Crome



NOAH WEBSTER, without a doubt, knew little of RELIANCE HY-CROME SPRING WASHERS when he wrote a definition for TENACITY. But this word describes one quality of Locomotive Hy-Crome Spring Washers which makes this device desirable in keeping highly stressed important locomotive bolts and parts TIGHT and in place. This TENACITY provides increased service from equipment by eliminating the necessity for frequent shoppings of rolling stock.

• The use of Locomotive Hy-Crome spread and grew as the knowledge of its effectiveness became available to railway motive power men. Reliance Locomotive Hy-Crome is THE Spring Washer with superior tension and non-fatiguing reactive pressures predetermined and calibrated to meet definite service requirements. That's your guarantee of TENACITY with a vengeance.



Write now for the six-page folder on Reliance Hy-Crome Spring Washers for Motive Power. You may also secure a list of important engine bolt applications for Locomotive Hy-Cromes, helpful in avoiding costly shopping hours.

EATON

EATON MANUFACTURING COMPANY

MASSILLON, OHIO

Reliance Division

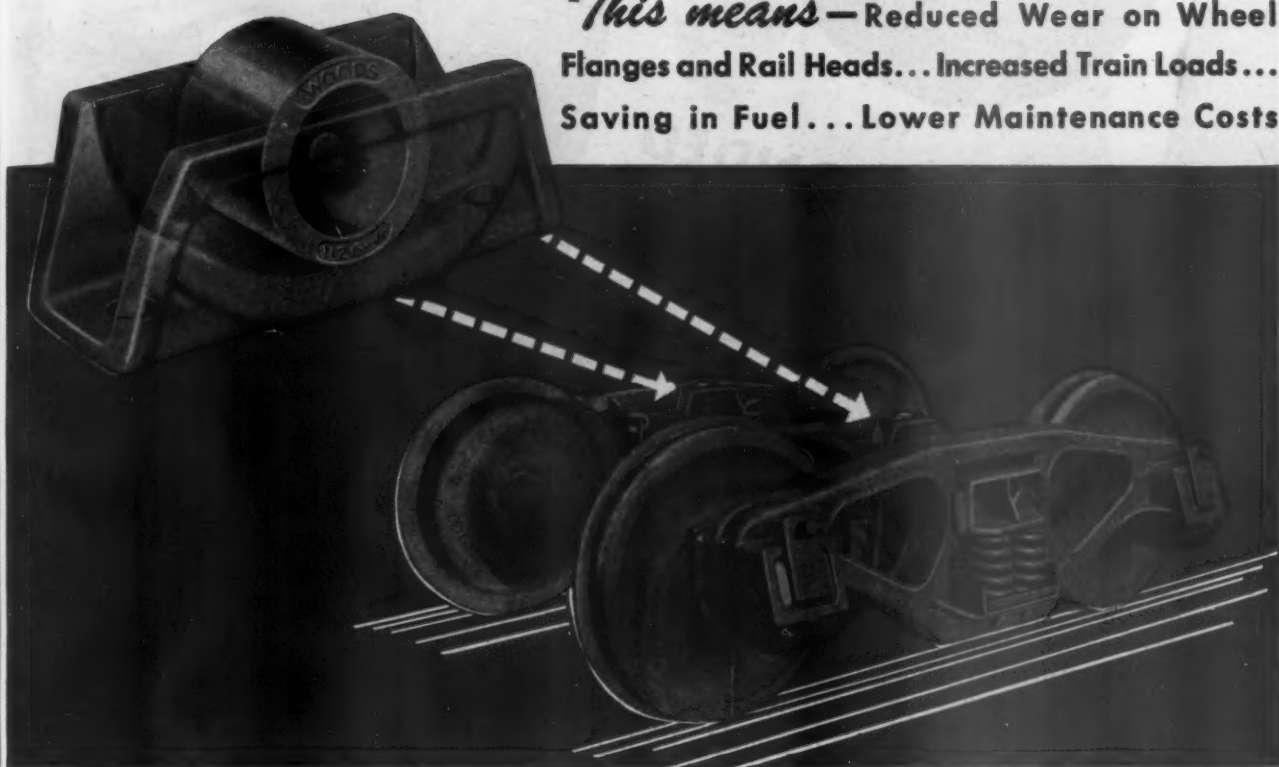
Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

Permits Free Movement of Car Trucks on Curves

EDWIN S. WOODS & COMPANY

NO. 1126 Forged Steel Roller Side Bearings

This means—Reduced Wear on Wheel Flanges and Rail Heads... Increased Train Loads... Saving in Fuel... Lower Maintenance Costs



The Edwin S. Woods No. 1126 Forged Steel Roller Side Bearing consists of only two parts, the housing and the roller.

The housing is made of special forging quality S.A.E. steel, and heat treated to insure a high Brinell.

The roller is forged from special forging quality S.A.E. steel, heat treated and oil quenched and is centered by gravity. This rugged two-piece construction feature allows a minimum of clearance between the housing side walls and the roller, thus assuring a true position of the roller at all times.

The web and rim construction not only permits complete heat treatment, but also allows for a lighter and

stronger A.A.R. bearing for all types of rolling stock.

Keep transportation going with all possible savings . . . keep more traffic rolling more economically by equipping all your rolling stock with Woods Roller Side Bearings.

LONGER LIFE—LESS REPLACEMENT OF SIDE BEARINGS

In order to obtain maximum hardness and toughness, important to long-lived wearing properties, roller bearings are heat treated. Because of the Woods' recessed roller design, with its rim and web construction, proper equalization of metal structure is obtained throughout by heat treatment. *Write for Bulletin.*

EDWIN S. WOODS & COMPANY Division of

Quality Since 1880

PETTIBONE MULLIKEN CORPORATION

4710 West Division Street, Chicago 51, Illinois



Photo Courtesy of J. P. Kelley Brass Foundry

One of many examples of how Hycar synthetic rubbers are helping all industry

METALWORKING men helped uncover another important industrial application for Hycar when natural rubber no longer could be used as a bonding material for abrasive wheels. In their search for a "substitute" they found a material that was *twice as good*. In a typical comparative test a natural rubber-bonded wheel was good for 50 cuts on manganese bronze castings for a total of 562 square inches. A Hycar-bonded wheel under identical conditions made 99 cuts for a total of 1013 square inches.

In the railroad industry, too, Hycar has helped increase efficiency and reduce operating expense. For example, hose made from Hycar gives longer service, requires less maintenance, and so means lower overall cost. That's because Hycar's many valuable inherent properties make

it the ideal resilient material to use where exposure to oil, sunlight, air, heat, cold, and abrasion are factors. In a long list of railroad applications Hycar's properties will mean a better performing product with a longer life.

Examine the list in the box at the right. Think of these properties in terms of your requirements for rubber parts. Keep in mind that it is possible to select exactly the right combination of properties to meet your established service conditions.

We make no finished parts of Hycar. We simply supply the raw material to rubber fabricators. However, our Technical Service Staff will be glad to work with you on any specific problem, difficult or routine. Ask your supplier for parts made of Hycar for actual test. For more information write Department P-2 for your

FREE copy of "Everywhere in Industry", the new booklet describing Hycar's characteristics, with full technical data. *Hycar Chemical Company, Akron 8, Ohio.*

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. **EXTREME OIL RESISTANCE**—insuring dimensional stability of parts.
2. **HIGH TEMPERATURE RESISTANCE**—up to 250° F. dry heat; up to 300° F. hot oil.
3. **ABRASION RESISTANCE**—50% greater than natural rubber.
4. **MINIMUM COLD FLOW**—even at elevated temperatures.
5. **LOW TEMPERATURE FLEXIBILITY**—down to -65° F.
6. **LIGHT WEIGHT**—15% to 25% lighter than many other synthetic rubbers.
7. **AGE RESISTANCE**—exceptionally resistant to checking or cracking from oxidation.
8. **HARDNESS RANGE**—compounds can be varied from extremely soft to bone hard.
9. **NON-ADHERENT TO METAL**—compounds will not adhere to metals even after prolonged contact under pressure. (Metal extrusions can be readily obtained when desired.)

Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

Synthetic Rubbers

IN PRODUCTION *Now*

on **EC** Silicone High Temperature Electric Insulation



EC 993 Silicone Mica-Glas approximately doubles the heat-resistant qualities of Class B electrical insulation.

No longer is its application limited to laboratory experiments. The oven shown above, with a temperature range between 200° and 600° F., is in full production in our plant.

If the life of your rotating electrical equipment is reduced by heat, humidity or corrosive atmosphere, if overloading causes premature failure or if coil maintenance cost is excessive we can help you. Let us supply you with Silicone Mica-Glas coils, Silicone insulating materials, Silicone varnish or complete Silicone Mica-Glas re-winds.

The large stator on the skid truck in the photograph above is from an 800 HP 1800 RPM 2300-volt 3-phase 60-cycle induction motor which operates a draft fan in the top of a power house, where very high ambient temperature exists.

The wound rotor in the right rear is from the same motor.

The circular coil to be baked on the skid at the right is an induction heating coil. It normally operates with a current of 1750 amperes at 500 volts.

The coil suspended in the rear is wound of rectangular copper tubing. In use, it is water cooled and is connected to a 200-Kva 800-volt 3000-cycle generator. Blanks for 500-lb. bombs are heated to red heat by this coil within less than one minute.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16,

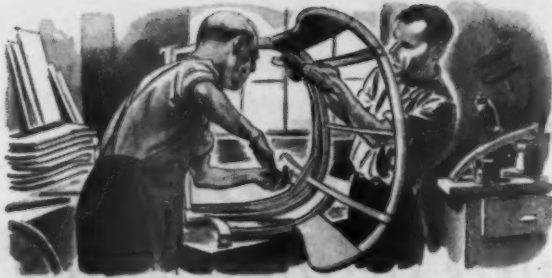
OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF
ELECTRICAL COILS AND INSULATION—



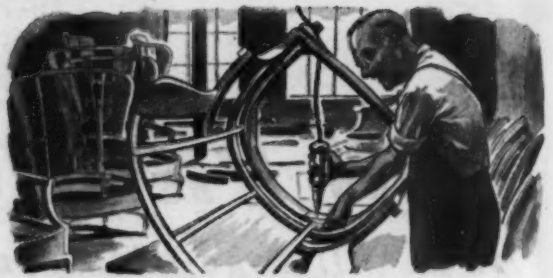
TRADE MARK

REDESIGNING AND REPAIRING OF
ROTATING ELECTRICAL MACHINES



BACKLOG BREAKERS!

Finding it impossible to keep pace with orders as long as he used slotted screws, one leading furniture maker broke up his assembly jams once and for all by switching to faster-driving Phillips Recessed Head Screws.



MONEY MAKERS!

This switch cut assembly time almost in half. It cut 10% off pre-assembly by making pilot holes unnecessary. On top of this it saved 33-1/3% in labor costs because Phillips Screws drive so much faster!



PRECEDENT SHAKERS!

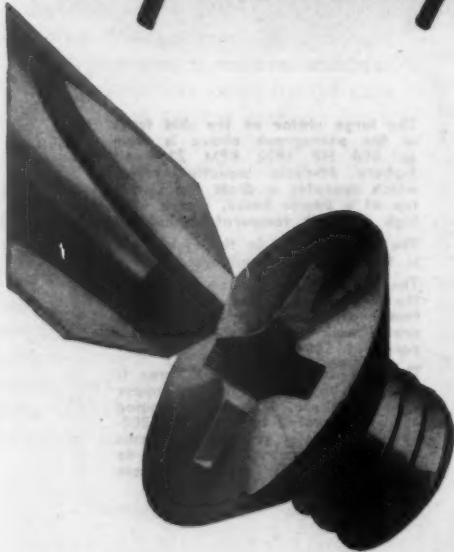
Pace-setters in production and cost-reduction activities, Phillips Screws are helping designers shake things up, too. Much more strength and rigidity can be built into products than was ever possible with slotted screws.



ORDER TAKERS!

And when it comes to buy appeal, other screws just aren't in it with Phillips Screws. Salesmen say they banish burrs that endanger both clothes and sales . . . and make any product look stronger, smarter, trimmer!

It's Phillips the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

... It's the exact pitch of the angles that eliminates driver skids.

... It's the engineered design of the 16 planes that makes it easy to apply full turning power - without reaming.

... It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% - cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS Recessed Head SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

25 SOURCES

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.

The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.

Phell Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdall & Ward Bolt & Nut Co., Port Chester, N. Y.
Sevill Manufacturing Co., Waterville, Conn.
Shakeproof Ins., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
The Steel Company of Canada Ltd., Hamilton, Canada
Wolverine Bolt Co., Detroit, Mich.



COUNT ON EASIER, FASTER MAINTENANCE of tomorrow's Air Conditioning Equipment

SCHEDULED FOR LONGER RUNS with less off-the-road time, the car of tomorrow won't be available as often or as long for maintenance and inspection of auxiliary equipment.

Keeping this in mind, Sturtevant Engineers have developed new designs for easier-to-maintain air conditioning equipment. There's the new Sturtevant 3-piece system, for example, ready for you as soon as conditions permit, and offering these time-saving features:

FASTER SERVICING

The separate condenser unit has a removable panel which permits easy checking of equipment inside. Your servicemen can quickly check the quantity of Freon in the receiver, take care of brushes on the condenser motor, operate the hand test switch and adjust hi-lo pressure cut-outs when necessary. And time is saved, too, during pumping down operations.

Air passes through the unit with minimum resistance, which together with the larger condenser coils,

makes for maximum air volume. You get, as a result, low head pressure and less power consumption by the compressor motor.

As for the compressor-motor unit, it's more exposed for quick repairs and servicing. Adjusting tension on the driving belt—a difficult job on most systems—is easier because the compressor unit is separate from other parts of the system. Main suction line valves and discharge valves are also conveniently located for the serviceman.

MANY OTHER IMPROVED UNITS

If your needs are for pressure ventilation, or complete ice or mechanical air conditioning systems, Sturtevant is all set with the most advanced equipment designs, ready to be planned into your cars. Call on our Railway Air Conditioning Engineers for counsel on the newest, most efficient methods for "putting air to work". There's no obligation.

B. F. STURTEVANT COMPANY
HYDE PARK BOSTON 36, MASS.
Branch Offices in Principal Cities

LOOK FOR—AND GET

These Sturtevant

Air Conditioning Advantages:

- 1 More uniform temperature and humidity conditions in the car.
- 2 Equipment designed for easy maintenance.
- 3 Equipment designed for minimum space and weight.
- 4 Equipment that requires a minimum power load.

Sturtevant
Puts Air to Work

STURTEVANT "Railroad" Units or Systems are used by 40 railroads and are covered by more than 60 issued patents and patents pending.

Then, considering the large quantity, early delivery and precision required, we all agree ... It's a job for Aeronautical Products » »



WHERE ordinary thinking stops, Aeronautical Products' engineers begin. Where normal precision techniques leave off, Aeronautical Products' exceptional machining methods take over. It's only natural, then, that our mammoth capacity, engineering genius and creative skill developed long before the war and now devoted to total war output, will give us continued Leadership in the peacetime production of precision parts for every

purpose. . . . Here in one organization with two great plants, is the *complete* precision parts picture . . . from creative engineering through all phases of manufacturing. So if you, too, are looking ahead, now would be a good time to solve your peacetime parts problem. Our Executive Sales Office will gladly mail you interesting facts on our plant facilities and equipment. Chances are, we have the answer you're searching for!

★
BUY
WAR
BONDS
★



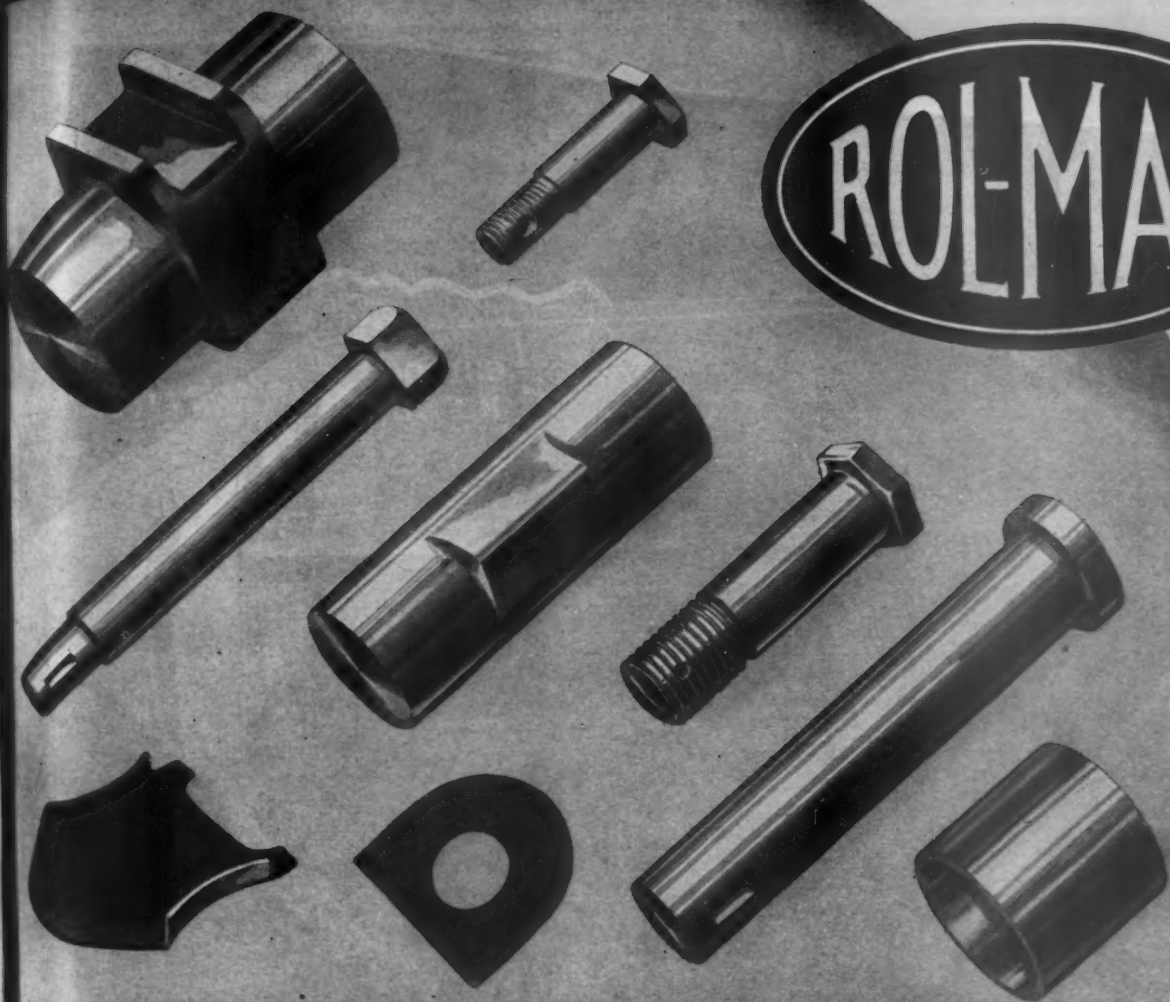
● Make ownership of a safe, sturdy Aeronautical Products Helicopter a "must" in your personal postwar plan. You'll find you can afford one!

AERONAUTICAL PRODUCTS, Inc.

DETROIT PLANT
and Administrative Offices:
18100 Ryan Road, Detroit 12



OHIO PLANT:
Washington Court House
Ohio



The Harder the Service the "Harder" ROL-MAN Becomes

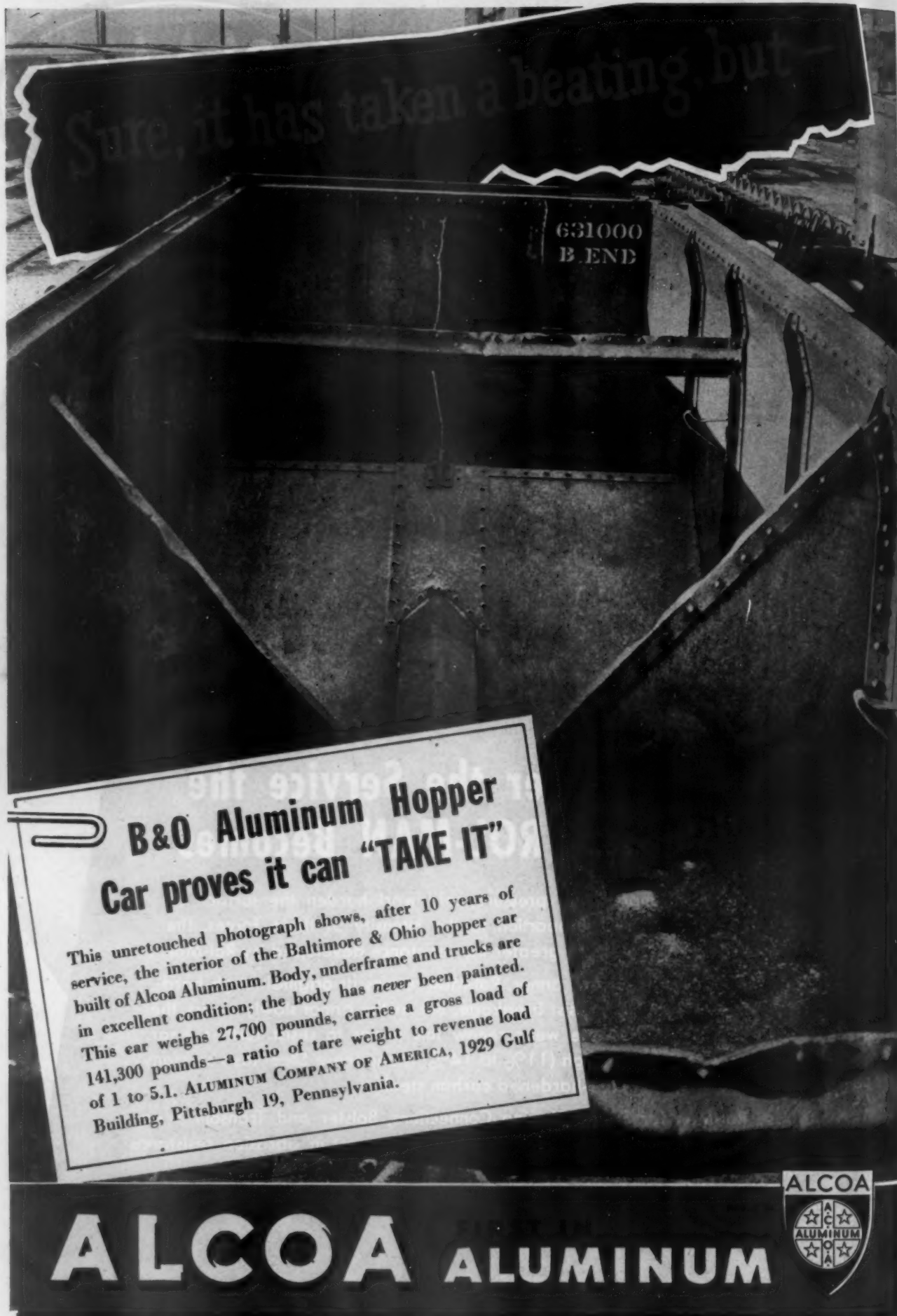
Abrasion, impact and pressure, cold work-harden the surface of Rol-Man in direct proportion to the intensity of these forces. The greater the forces, the greater the resistance developed by Rol-Man. Underneath its surface armor, Rol-Man retains its original tough-hardness and ductility to resist breakage. But as the armor slowly wears, the forces that caused the wear renew this armor to resist further wear. That's why Rol-Man High (11% to 14%) Manganese Steel lasts so many times longer than case-hardened carbon steel.

Use Rol-Man for Spring Rigging Connections, Bolster and Transom Wear Plates and all other parts that demand the utmost in abrasion resistance and strength on Passenger Cars and Locomotives.

Manganese Steel Forge Co., 2813 Castor Avenue, Philadelphia 34, Penna.

PINS • BUSHINGS • WEAR PLATES

Rol-Man Pins and Bushings are ground to precision diameters. Wear Plates are fabricated to your specifications, ready for installation.



B&O Aluminum Hopper Car proves it can "TAKE IT"

This unretouched photograph shows, after 10 years of service, the interior of the Baltimore & Ohio hopper car built of Alcoa Aluminum. Body, underframe and trucks are in excellent condition; the body has never been painted. This car weighs 27,700 pounds, carries a gross load of 141,300 pounds—a ratio of tare weight to revenue load of 1 to 5.1. ALUMINUM COMPANY OF AMERICA, 1929 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM



**Modern PHILCO
Diesel Batteries
help keep Kaiser
tonnage moving!**

Locomotive hauls ladle cars away from Blast Furnace
after a cast. Photo courtesy of Kaiser Company.

AT KAISER STEEL WORKS, Fontana, California, Philco diesel starting batteries provide dependable starting power for a fleet of 80-Ton G.E. diesel electric switching locomotives. The great advantage of a Philco in such service is its thorough dependability—its extra wallop that always starts a diesel engine immediately. Important, too, are the extra quality features in a Philco, which have widely demonstrated their longer life and lower cost. New Philco Battery catalogs for all services are now available. Write today. **PHILCO CORPORATION**, Storage Battery Division, Trenton 7, New Jersey. *Makers of the famous Philco "Thirty".*

Typical 56-cell
Philco Diesel
Starting Battery



SPECIFY

PHILCO
STORAGE BATTERIES

FOR 50 YEARS A LEADER IN INDUSTRIAL STORAGE BATTERY DEVELOPMENT

May, 1945

127

Keep more cars moving!

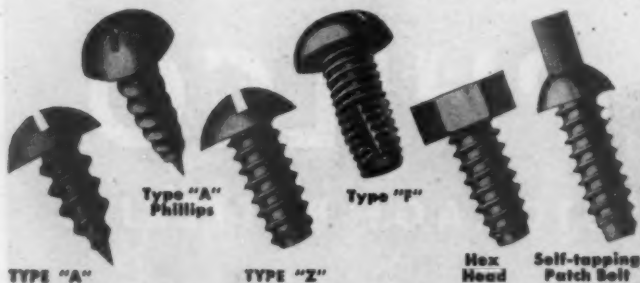
Save repair time with the Short Cut Fastening Method



"BAD ORDER" cars, waiting for repairs, won't help you cut down your backlog of war-important ladings. Get 'em back in service by speeding repairs with the *Short Cut Fastening Method*, Parker-Kalon Self-tapping Screws.

SAVINGS OF 25% to 50% in assembly time and labor are commonplace when P-K Screws replace slow, awkward fastening methods. Whether the fastening is made to light or heavy steel, cast iron, aluminum, brass, plastics, or other material—there's a P-K Screw that will make it faster and better.

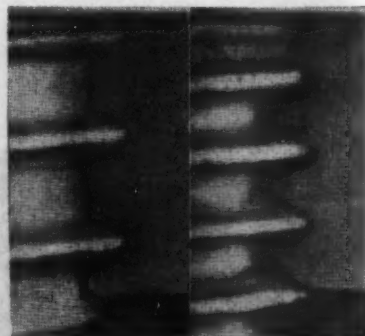
ASK FOR A P-K ASSEMBLY ENGINEER to help you find all the savings you can be making, or, mail fastening details for recommendations and samples. Parker-Kalon Corporation, 208 Varick Street, New York 14, N. Y.



SELF-TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY



DRILL — DRIVE — AND IT'S DONE! The P-K Screw makes its own threads in a plain, untapped hole. No tapping and tapping plates—no troublesome lining up—no awkward bolting or riveting for reassembly.



STRONGER FASTENINGS, TOO! Compare tight engagement of P-K Screw (left) in metal with "loose" fit of machine screw (right) in tapped hole. P-K Screws do not loosen, even under severe vibration.



POWER DRIVING is possible with P-K Screws. Added to simplicity of fastening, this often more than doubles the rate of speed that would be attained with other fastening methods.

PARKER-KALON
Quality-Controlled
SELF-TAPPING SCREWS



DOW CORNING

SILICONES

**DOW CORNING, first in silicones,
is fully equipped with new plant and facilities for
the production and distribution of an expanding line of silicone products**

American industry has been quick to utilize the new Dow Corning Silicones—to see the potentialities inherent in their higher order of heat stability, chemical inertness, water resistance, and dielectric properties. Dow Corning is now supplying, directly or through selected distributors, the following silicone products:



FLUIDS

Water-white, odorless, inert Silicone Liquids . . . notable for their low rate of viscosity change over a wide temperature range, low vapor pressure, water repellency, and good dielectric properties.



993

Insulating Varnish . . . recommended because of its extreme heat stability for impregnating, coating and bonding, and waterproofing inorganic insulating materials such as asbestos, mica, and Fiberglas cloth, tape, and sleeving. Other special purpose silicone resins and compounds are available.



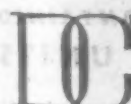
4

Ignition Sealing Compound . . . an easily applied silicone waterproofing compound having excellent dielectric properties, corona resistance, and the consistency of petroleum jelly. It neither hardens nor melts at temperatures ranging from -40°F. to 400°F.



STOPCOCK GREASE

A chemically resistant Silicone Grease for lubricating stopcocks and other ground glass joints.



7

Special Low Temperature Compound . . . an oxidation resistant lubricant and sealing compound developed for use at temperatures as low as -70°F.



PLUG COCK GREASE

A Silicone Grease that affords easy operation of lubricated plug valves over wide temperature ranges in most difficult services.



31

A lubricating Silicone Grease for special applications in the temperature range of -70°F. to 190°F.



41

A lubricating Silicone Grease for special applications where operating temperatures range from 0°F. to 400°F.

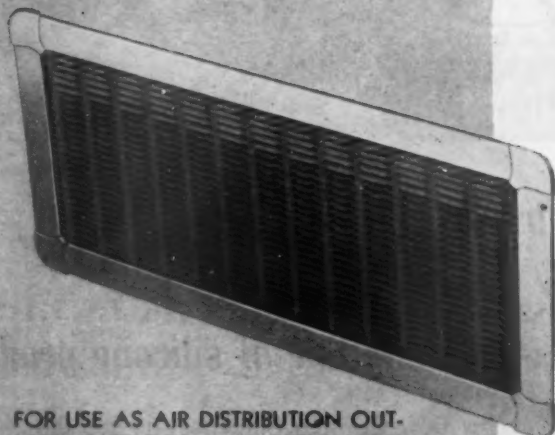
Dow Corning

FIRST IN SILICONES

DOW CORNING CORPORATION
MIDLAND, MICHIGAN
ADDRESS ALL INQUIRIES TO BOX 592

BARBER-COLMAN

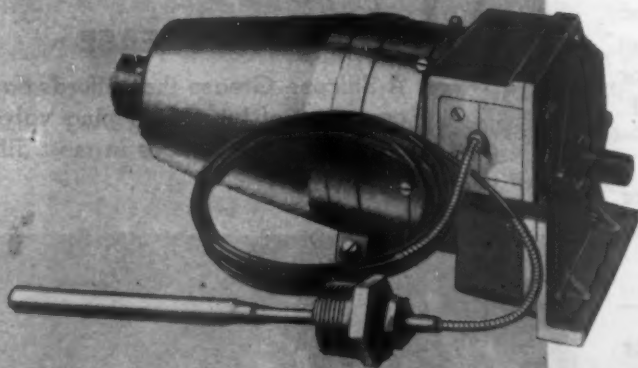
PRODUCTS FOR RAILWAY SERVICE



FOR USE AS AIR DISTRIBUTION OUT-LETS, OUTDOOR AND RETURN AIR REGISTERS AND TRANSFER GRILLES FOR COMPARTMENT DOORS.



FOR OVERHEAD AIR DISTRIBUTION IN PASSENGER CAR SPACES, SMOKING ROOMS, AND PASSAGEWAYS.



FOR PROPORTIONING CONTROL OF DIESEL ENGINE OIL AND COOLING WATER TEMPERATURES.

uni-flo

GRILLES and REGISTERS

UNI-FLO Grilles and Multi-louver Registers are ideal for railway service. They are fabricated of *sheet steel*. The core construction is *rigid*. The fin strips are folded and have pressed-in support bars to give a firm interlocking assembly. Registers have a series of one inch wide overlapping blades to provide *tight shut-off*.

venturi-flo

CEILING OUTLETS

VENTURI-FLO Ceiling Outlets are fabricated of *spun steel* members, and have been designed for center duct air distribution systems. They have flow characteristics similar to those of the well-known fluid flow measuring device, the Venturi meter. When desired, provision can be made for quick removal of the unit for cleaning the supply duct.

SELF-CONTAINED POWER UNITS

Self-Contained Power Units have been designed for automatic control of oil and cooling water temperatures. These accurate and dependable units maintain temperature by positioning the cooler shutters. They give true proportioning operation without overrun or "hunting".

BARBER-COLMAN

COMPANY

ROCKFORD • ILLINOIS

THIS PRESSURE-CREOSOTED DECKING

paid for itself last year
now-it's paying dividends

This flat car was decked with pressure-creosoted pine in 1937 and, like all rolling stock, has since been taking a terrific beating. No replacements had been made up to the end of 1944 and as the illustration shows, the deck is still in serviceable condition.

According to reports, five years is about the average life of untreated open car decking. As the additional cost of creosote treatment is covered by only two years' added life, the extra service ob-

tained from the decking on this car has already written off the treating cost. The remainder of its useful life—probably another five to seven years—will be clear profit.

Some railroads, by using pressure-creosoted wood, have doubled and even tripled the useful life of car decking. Savings both in

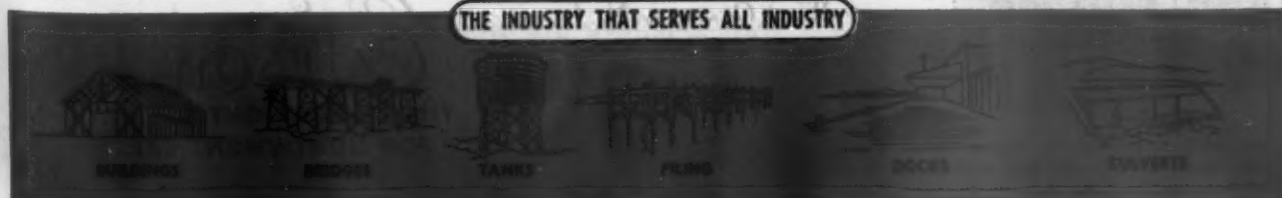
dollars and in relieving overworked shops have been so impressive that maintenance engineers are asking themselves if they can afford *not* to use pressure-treated lumber. We will be glad to quote you prices so that you can figure out how much the change would mean to you in dollars and cents.

KOPPERS COMPANY, INC. • WOOD PRESERVING DIVISION
PITTSBURGH 19, PA.

KOPPERS

Buy War Bonds—
 and Keep Them!

THE INDUSTRY THAT SERVES ALL INDUSTRY



Good Companions



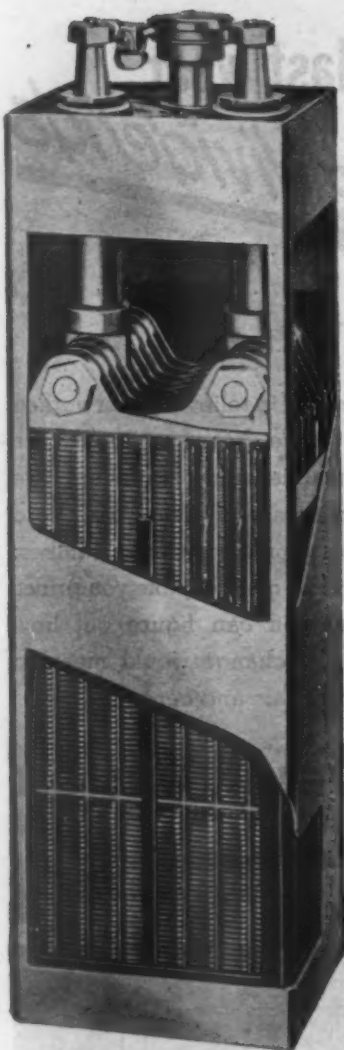
...on Your Post-War Cars

1. Passenger comfort
2. Light weight
3. Alkaline batteries

Ample refrigerating capacity for air conditioning, high standards of illumination, radios, motion pictures, and many of the other features now being planned for passenger comfort will function from the electrical power supply of the car.

The trend will very probably be toward more of these features, higher electrical loads, and batteries of higher capacity. If so, batteries will be needed that provide increased capacity with the least additional weight and with the greatest inherent dependability of operation. All of these requirements are met by Edison Alkaline Batteries. *Edison Storage Battery Division of Thomas A. Edison, Inc.,*

West Orange, N. J.



Steel cell construction is an important reason for the durability and light weight of Edison Alkaline Batteries.

Edison
THE LIGHTWEIGHT BATTERY
FOR LIGHTWEIGHT CARS

new *Aluminum* box cars
go on

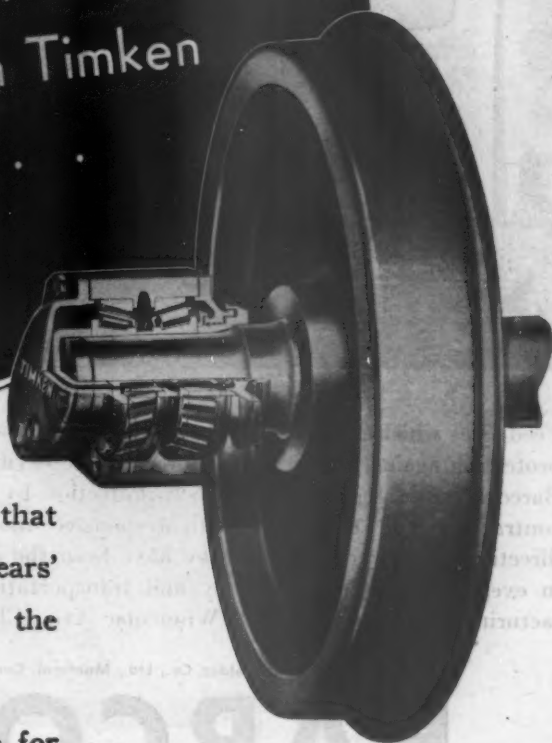
TIMKEN BEARINGS!

Five Aluminum box cars now under
construction for the Rock Island Lines
are being equipped with Timken
Roller Bearings

The type of bearing mounting selected
for these cars is the same as the mounting that
has proved so successful in over five years'
service under ten high-speed box cars on the
Union Pacific R. R.

Timken Roller Bearings now are available for
all types of new high-speed freight car trucks.

THE TIMKEN ROLLER BEARING
COMPANY, CANTON 6, OHIO



TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
RAILWAY ROLLER BEARINGS



Feed lines which carry the essential fluids of industry need constant protection against those "traffic interrupters"—vibration and shock. Barco Flexible Joints provide such protection by compensating for contraction and expansion with responsive movement in every direction. For over 30 years they have been the accepted standard in every field of both industry and transportation. Barco Manufacturing Co., Not Inc., 1808 Winnemac Ave., Chicago 40, Illinois.

In Canada: The Holden Co., Ltd., Montreal, Canada

BARCO

FLEXIBLE JOINTS

THE FREE ENTERPRISE SYSTEM IS THE SALVATION OF AMERICAN BUSINESS



"MOVE IN

EVERY

"DIRECTION"

Not just a swivel joint... but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.

RAILWAY MECHANICAL ENGINEER

soften up the SHOCK!



**Style A-6-A
HOLLAND
Volute
SNUBBER SPRINGS**

Overburdened Spring Groups are one of the results of war-traffic-increased loads and speeds. The many-time-multiplied spring shocks are being softened on many cars by the use of Holland Volute Snubber Springs.

SIGNAL CORPS PHOTO

HOLLAND COMPANY

332 SOUTH MICHIGAN AVENUE, CHICAGO, ILLINOIS

★ Uncle Sam Uses Volute Springs On Many Tanks

Your present study of all phases of

TRAIN COMMUNICATIONS

for the expedition of train movements must finally resolve itself into some form of **POWER CONVERSION**

Whether the system requires A-C or D-C or combinations of both, The Safety Car Heating and Lighting Company, Inc., is prepared to provide inherent regulation of both voltage and frequency.

Work in which this company is engaged requires a thorough study of radio noise elimination. Our facilities for this work are complete, so that we are prepared to furnish power conversion equipment from which radio noise is eliminated.

We have a complete line of motor alternators, dynamotors, and dual voltage generators, from which equipment can be supplied to meet the requirements of any particular problem.

To all railroads and to all manufacturers of communication equipment we offer the complete facilities of our experienced engineers and laboratory equipment.



THE SAFETY CAR HEATING and LIGHTING COMPANY, INC.
NEW YORK - CHICAGO - SAN FRANCISCO - PHILADELPHIA - BOSTON - ST. LOUIS - MONTREAL





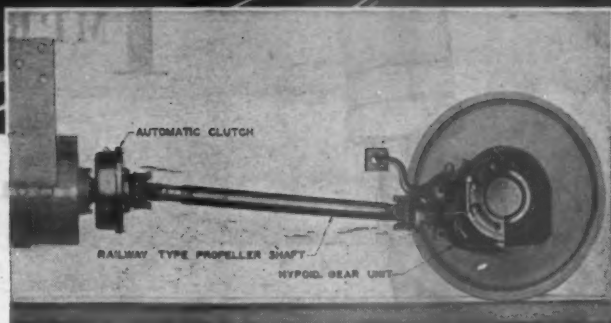
uses the SPICER *Positive Generator Drive*



The Southern Railway Southerner equipped with Spicer Positive Generator Drive.

★ The modernization of existing cars, and the development of new cars incorporating high standards of passenger comfort, will require increased and more dependable electrical power to satisfactorily operate many additional improvements that will be adopted, such as air conditioning, electrostatic air cleaning, greater lighting, electro-mechanical water coolers, radio, electric kitchen equipment, etc. Cars will operate generally at higher speeds and will be much quieter and smoother. All of these are factors emphasizing the importance of using a reliable generator drive.

The Spicer Drive is a positive means of transmitting power from the axle of a railway car to a generator, air conditioning unit or other equipment on the car body. It is manufactured, sold and serviced by the Spicer Manufacturing Corporation, Toledo, Ohio, which has had over 40 years of experience in designing and building power transmission equipment. The Spicer Positive Generator Drive was developed after many years of



Exterior and cross-section view of Spicer Positive Generator Drive

intensive research and testing, both in the laboratory and in actual operation under railway cars. There are more than two thousand Spicer Drives in use at the present time. Several hundred of these have been in constant operation for four to six years. They are being used by twenty-seven of the leading railroads and many are on the new streamline high speed deluxe trains.

The simple means of applying the Spicer Drive makes it readily adaptable to both old and new cars with few, if any, changes necessary in the car, truck or axle construction.

Other Spicer features include high efficiency and economy, safety, quietness and smoothness. Write for full details and literature describing *all* the profitable advantages Spicer Positive Generator Drives make available to you.

42 YEARS OF

Spicer

SERVICE

Positive Generator Drive

Manufactured, Sold and Serviced by
Spicer Manufacturing Corporation, Toledo, Ohio



First
10 YEARS
AGO
First
TODAY

I

MPROVED Houdaille railroad

hydraulic shock absorbers for

vertical and lateral control are

now ready for the new railroad

world of tomorrow.

HOUE ENGINEERING DIVISION OF
HOUDAILLE-HERSHEY CORPORATION
MAKERS OF HYDRAULIC CONTROLS
BUFFALO 11, NEW YORK

*Pronounced—Hoo-dye

Kelite Simplifies

WASHING & CLEANING!



When Kelite materials such as these are used with accurate pH Control as recommended by the Kelite Service Engineer, you will find the door open to a new, high standard of efficiency in washing, cleaning and maintenance.

MOCKING is easier with Kelite Formula 808, a specialized compound which cuts alkali film, makes coaches rinse off free and clean with no streaking. Formula 808 is harmless to paint.

Kelite Protexol wets out grease and oil . . . takes a lot of the hard work out of cleaning greasy coaches, like those behind the power unit. It is safe for paint and all metal surfaces.

Head Lining, Side Lining, and Commissary Cleaning of all kinds go easier and faster with Kelite No. 184, the new washing powder which soaks in, loosens and floats soil away. No hard rubbing or scrubbing are necessary for inside clean-up work when No. 184 is used. That means important savings in time and labor; and, because No. 184 rinses free, the results look better.

For heavy jobs like truck cleaning, spraying with Kelite Protexol and kerosene or steam cleaning with Kelite No. 50 will get the work done in a hurry. Degreasing in diesel shops goes faster with the aid of a hot tank of Kelite No. 158. Boilers, condensers and heat exchangers are readily descaled with Kelite Scale-Off, which readily removes scale and rust without harming healthy metal.

By constant adherence to the pH chart, which accurately measures the cleaning power needed for every type of soil removal and shows the exact limits of safety for the surface being cleaned, Kelite has taken the guesswork out of cleaning . . . provided a reliable key to easier cleaning. Ask your local Kelite Service Engineer or write Kelite Products, Inc., 909 E. 60th St., Los Angeles 1, Calif.

Executive Offices: 909 East 60th Street, Los Angeles 1. Manufacturing plants in Los Angeles, Dallas, Chicago, and Perth Amboy. Branches in principal cities. "Kelite" Reg. U. S. Pat. Off., Chart copyrighted 1942 by Kelite Products, Inc.

KELITE

SCIENTIFIC CLEANING THROUGH pH CONTROL



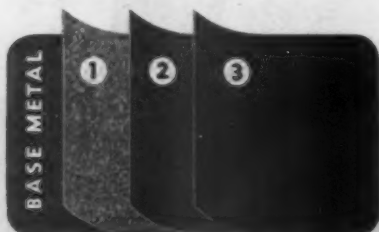
HERE IS Triple Protection FOR YOUR CAR ROOFS



"Triple protection" is no empty phrase when you specify ARMCO ZINCGRIP-PAINTGRIP sheet steel for car roofs. This leaf-type drawing shows how the steel is protected three ways:

1. ARMCO ZINCGRIP: A special zinc coating under—
2. ARMCO PAINTGRIP: A smooth, Bonderized finish that insulates zinc from—
3. Paint applied in any color.

ZINCGRIP-PAINTGRIP has many advantages for car roofs. It can be



drawn to the most intricate designs—without injuring the special zinc coating. No peeling or flaking, no unprotected seams to invite rust attack.

It Grips Paint

Next, the mill-Bonderized PAINTGRIP finish holds paint without costly pre-treatments. Less paint is needed because no primer coats are necessary.

These freight and passenger car roofs last longer and look better because PAINTGRIP retards drying-out of the paint. Maintenance and replacement costs go down and stay down.

You'll want to consider this special-coated sheet steel for car roofs and other applications where sheet metal must be formed and painted immediately. Shall we send you more data? Just address Armco Railroad Sales Co. Inc., 181 Curtis St., Middletown, O.

A Quick Check-List of Advantages

- ★
COMPLETE ZINC PROTECTION
- ★
LESS PAINT NEEDED
- ★
LONGER PAINT LIFE
- ★
LESS MAINTENANCE
- ★
LOWER OVERALL COSTS

ARMCO RAILROAD SALES CO. INCORPORATED



WHEN THE BATTERIES ARE EXIDES LIGHTS STAY BRIGHT—CARS ARE KEPT COOL

Uniformity is assured when the current for car lighting and air-conditioning is supplied by Exide Batteries. Even during long stops, lights glow strong and steady; and on the hottest days and nights, cars can be kept comfortably cool.

With passenger traffic at its peak, and the strain on equipment exceptionally severe, battery efficiency has become doubly important. Exides have the high capacity needed to

carry the extra load, and their rugged construction enables them to endure the greater hardships of today. You can always count on Exides for dependability, long-life and ease of maintenance. When you buy an Exide, you *Buy to Last*.

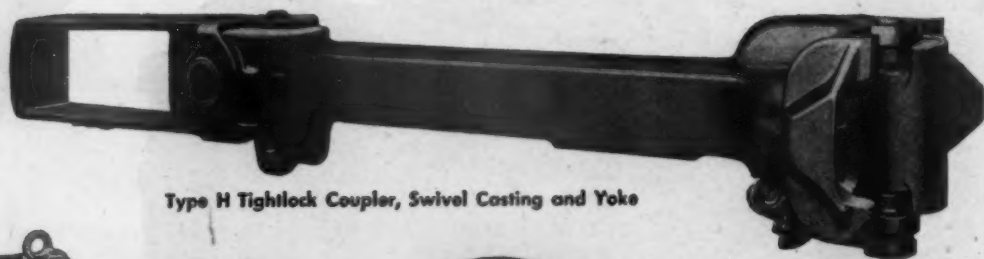


Exide
BATTERIES

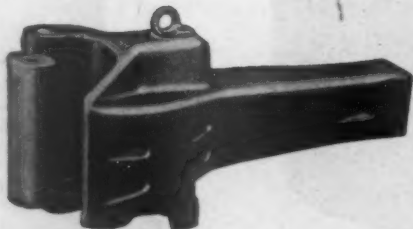
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

NATIONAL PRODUCTS

FOR RAILROAD EQUIPMENT



Type H Tightlock Coupler, Swivel Casting and Yoke



A. A. R. Std. E. Coupler



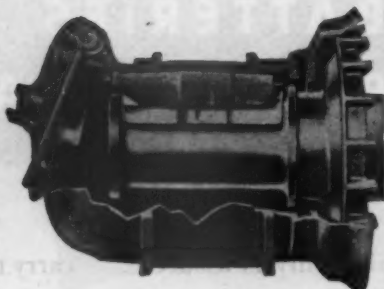
Naco Spun Steel Car Wheel



A. A. R. Alternate Std. E. Coupler



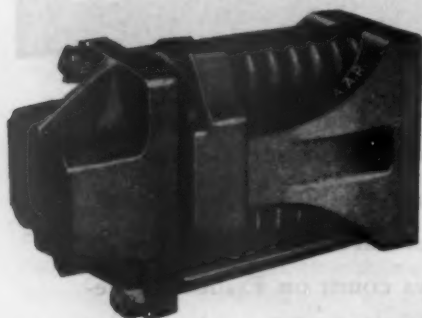
A. A. R. Std. Vertical Plane Horizontal Key Yoke



National Journal Box with Deflecting Fan and Flexo No. 2 Lid



A. A. R. Alternate Std. Vertical Plane Swivel Yoke



M-17-A Draft Gear
A. A. R. Approved



M-50-B Draft Gear
A. A. R. Approved



National B-1 Truck with Dual Control

76 YEARS SERVICE
To Transportation

NATIONAL MALLEABLE AND STEEL CASTINGS CO
General Offices: CLEVELAND, OHIO

Sales Offices: New York, Philadelphia, Chicago, St. Louis, San Francisco
Works: Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, Ill.

Rehabilitation

FOR FREIGHT CARS



Especially designed for quick and easy installation on freight car trucks, this new Monroe Airplane Type Hydraulic Shock Absorber can help more than 2,000,000 freight cars in meeting today's and tomorrow's requirements for longer and safer hauls and fast freight service.

By absorbing destructive and dangerous vibrations, the new Monroe Airplane Type Hydraulic Shock Absorber protects lading, equipment and roadbed . . . reduces maintenance costs and damage claims.

Embodying the same exclusive Monroe Hydraulic Shock Absorber principles that have proved their superiority over millions of railway car miles*—they are a *proved* product.

This latest Monroe Hydraulic Shock Absorber for freight car trucks *fits right* in . . . with no holes to drill . . . it replaces one of the springs or frictional snubbers in the cluster.

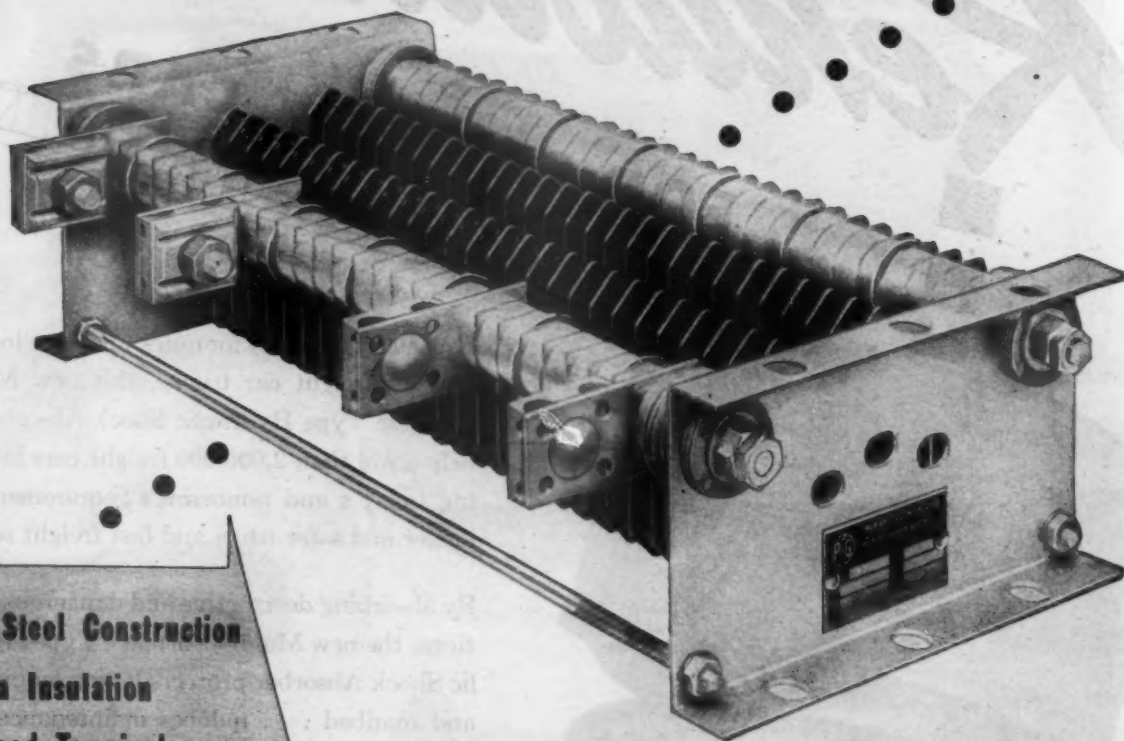
Our engineers will gladly work with you in the application of this modern new Monroe Airplane Type Hydraulic Shock Absorber for the rehabilitation of your freight cars.

RAILWAY SUPPLY DIVISION



* In use since 1938 on high speed crack streamliners, Monroe Airplane Type Hydraulic Shock Absorbers have smoothed the ride and saved thousands of man hours' maintenance time. They demonstrate the soundness of exclusive Monroe Hydraulic Shock Absorber principles.

Built... FOR SEVERE SERVICE



- ☆ All Steel Construction
- ☆ Mica Insulation
- ☆ Rugged Terminals
- ☆ Provision for Expansion
- ☆ Adequate Ventilation
- ☆ Unaffected by Vibration
- ☆ Moisture Resistant
- ☆ Corrosion Protected

P-G *for* Heavy Duty Applications...

By use of those durable raw materials . . . steel and mica, and the P-G exclusive features of design, these Steel Grid Resistors have the extra stamina to overcome factors which often cause resistor failures. Neither vibration, moisture nor corrosive atmospheres have material effect on continuity of service. Try Post-Glover Resistors for heavy duty applications where resistors are subject to severe service . . . continuous trouble-free performance is assured. BULLETIN No. 500 gives detailed information . . . Copy on request.




The Nonbreakable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

• ESTABLISHED 1892 •

221 WEST THIRD STREET, CINCINNATI 2, OHIO

**FOR CAR LIGHTING
AND HEADLIGHTING**
See Electric Service



DESIGNERS, ILLUMINATION
ENGINEERS and MANUFACTURERS

ELECTRIC SERVICE MANUFACTURING CO.

Main Office and Laboratories

17th & CAMBRIA STREETS • PHILADELPHIA 32 • PA. • Branches in Principal Cities

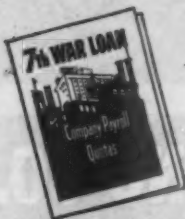
**IT'S UP TO YOU
TO HELP MAKE
2=3 WITH...**

A job for seasoned executives—this 7th War Loan! Especially when we've got to make 2 war loans total just about as much as all 3 in 1944! Putting this over demands the combined and *continued* efforts of the "No. 1" men of American industry.

This means marshaling your plant drive to make every payday—from now 'til June 30th—do its share toward the success of the 7th. Directing the drive is not enough. It's equally important to check to see that your directions are being carried out—intelligently!

For example, has every employee had:

- 1 an opportunity to see the new Treasury film, "Mr. and Mrs. America"?
- 2 a copy of "How To Get There," the new Finance Division booklet?
- 3 a new bond-holding envelope with explanation of its convenience?
- 4 7th War Loan posters prominently displayed in his or her department?
- 5 information on the department quota—and an urgent personal solicitation to do his or her share?



If you haven't a copy of this important booklet, "7th War Loan Company Quotas," get in touch immediately with your local War Finance Chairman.

The Treasury Department acknowledges with appreciation the publication of this message by

RAILWAY MECHANICAL ENGINEER



Remember, meeting—and beating—your highest-yet 7th War Loan quota is a task calling for "No. 1" executive ability. Your full cooperation is needed to make a fine showing in the 7th! Do not hesitate to ask your local War Finance Chairman for any desired aid. It will be gladly and promptly given.

★ This is an official U. S. Treasury advertisement prepared under the auspices of Treasury Department and War Advertising Council ★

*Looks like we've arrived at
the Land of Nod, Ma'am!*



You, who design the rail transportation which will compete successfully for tomorrow's travel dollars, know well the proved dependability—and *quietness* of V-Belts—of Dayton Railway V-Belts. You know that tomorrow these belts must assume even greater responsibilities.

For tomorrow's rail travel *must* include comfort—reliability—speed and shh!... quietness!

The men of Dayton's Railway Division know this too—and they'll be ready to serve you in the future, as in the past, with properly engineered V-Belts for your most exacting needs.

THE DAYTON RUBBER MANUFACTURING COMPANY

DAYTON 1, OHIO

40 years experience in both natural and synthetic rubber processing



Dayton Two-Block "B-4" V-Belt Drive

Railroad V-Belts by

Dayton
RED TRADE MARK THE DAYTON RUBBER MFG. CO.
Rubber

THE MARK OF TECHNICAL EXCELLENCE IN SYNTHETIC RUBBER

PASSENGERS WILL BE MORE DISCRIMINATING!



HOT ZONE

MODERATE
ZONE

COLD ZONE



ESTABLISHED 1898

Fiberglas*

*Trademark Reg. U. S. Pat. Office by Owens Corning Fiberglas Corp.

Keeps Them In The Comfort Zone



Here are a few of the different forms of Fiberglas Insulation for railroad equipment.

Fiberglas Passenger Car Insulation has been tested, approved and used extensively by every major railroad and car builder...on practically all de luxe "name trains."

Summer or winter, railroad passengers of tomorrow will demand Comfort. Whether they ride in club car, bedroom, or coach, they will expect to enjoy "the moderate zone" the year around.

Fiberglas, the insulating material of tomorrow, here today, efficiently seals in the manufactured comfort of air-conditioning and heating equipment and seals out uncomfortable weather. And it is fireproof, light weight, reduces noise. To gain these benefits, specify Fiberglas in your designs—be sure of permanent, efficient insulation year after year.

Now available to railroads and car builders. Complete information on extraordinary new developments in Fiberglas insulations sent at your request.

Fiberglas* is sold to Railroads and Car Builders exclusively by

GUSTIN-BACON MFG. COMPANY

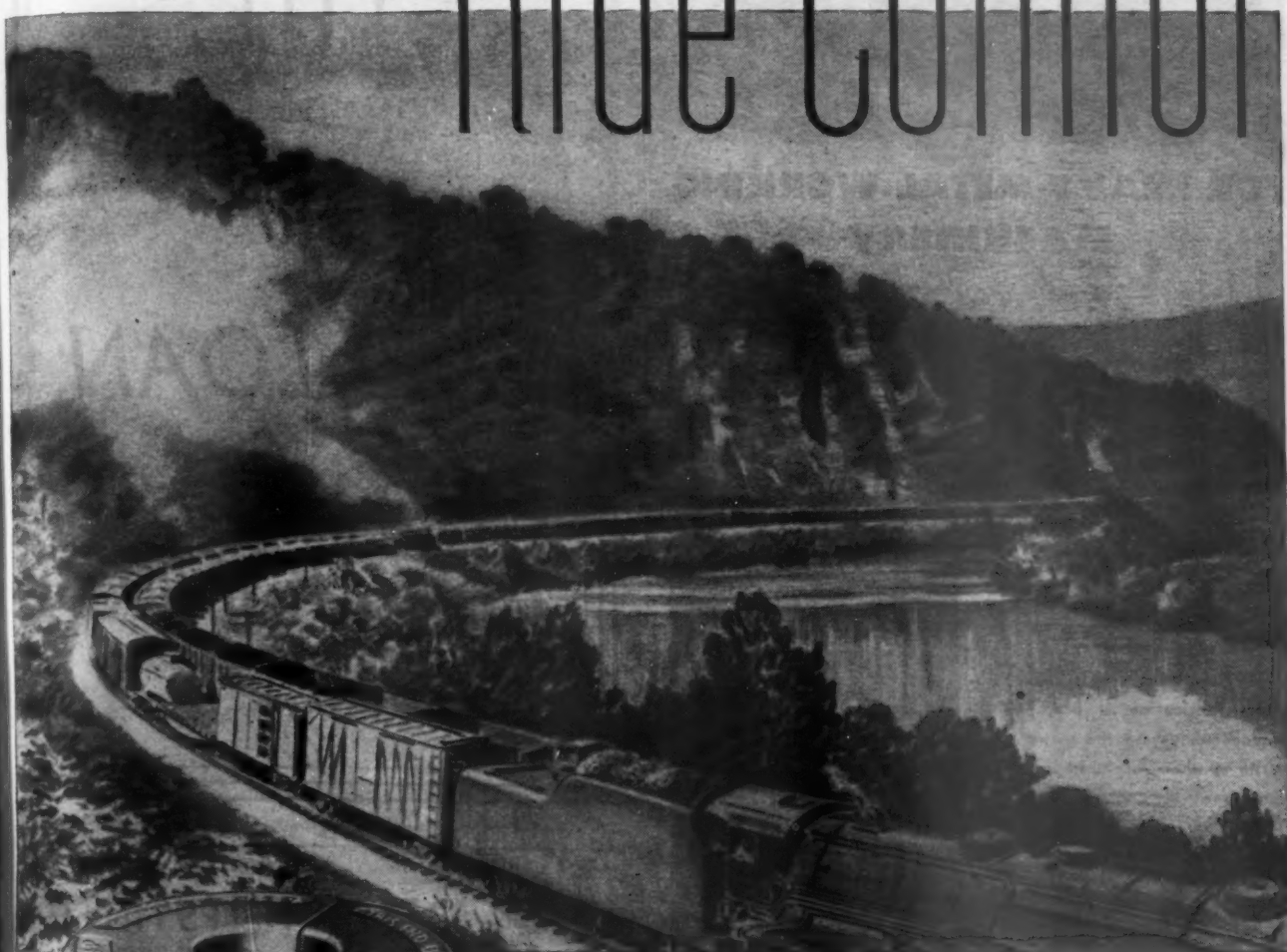
KANSAS CITY 7, MISSOURI

New York • Philadelphia • Chicago • Tulsa • Houston • Fort Worth • San Francisco



RAILWAY INSULATIONS MADE OF FIBERGLAS*

Ride Control



Cardwell Friction
Bolster Spring
Type A

Cardwell Friction Bolster Springs

Permit higher Speeds with Safety . . . Control Bouncing and Side-
swaying—thereby providing effective Ride Control. Protect Cars
and Lading against road shocks.

Cardwell Westinghouse Co., Chicago
Canadian Cardwell Co., Ltd., Montreal

SEE BEATTY

FOR HEAVY METAL WORKING MACHINERY

If you have a problem in heavy metal fabrication, a BEATTY engineer may have the answer. Write us when your next problem arises.



BEATTY

MACHINE &
MFG. COMPANY
HAMMOND
INDIANA

BENDING
BLANKING
BULLDOZING
COPING
EXTRUDING
FLANGING
FORMING
JOGGLING
PUNCHING
Structural
Plate
SHEARING
SHAPING
STRAIGHTENING
PERFORATING

THE

7TH

WAR LOAN

BUY BONDS

PAPER HELPS FINISH THE JOB

Don't take paper for granted. Waste paper used to be as common as air or grass. Today it must be conserved as a raw material for the manufacture of new paper and paperboard.



Paper packages, medical and food supplies for liberated peoples, for armies of occupation and for the fighting forces everywhere. Every article going overseas . . . each tiny surgical needle and instrument part . . . every tank or plane . . . is made, wrapped or tagged with paper. Your waste paper is a basic raw material for that war paper.

Your wastebasket scraps can help supply the needed wrapping and packaging materials—if you make sure they are collected.

Wastebasket scraps, brown corrugated cartons, brown wrappings or bags, old newspapers and magazines . . . all should be saved, collected and put to work again.



U. S. Victory Waste Paper Campaign

Photo shows one welding application of Mines Molded Rubber Connectors.



There's a Water-Seal MOLDED RUBBER CONNECTOR

**Designed For Any Portable
Power Supply Application**

Many types and sizes of Mines Molded Rubber Connectors have been developed, making them adaptable to almost any application where power is transmitted by portable cable. Stationary receptacles are also available for each portable type.

Molded on the desired cable length for the work to be done, Mines Cable Connectors become a part of the cable itself.

The spring pressure female contacts and the water-seal assure you a safe, positive connection with the male connector for efficient power supply to any machine under all plant conditions.

Mines Water-Seal Connectors are available in single conductor and multi-conductor types.

Our engineers will gladly work with you in solving portable power transmission problems on capacities up to 5000 volts and 325 amps.

Write for Bulletin MC-106.

MINES EQUIPMENT COMPANY

4275 Clayton Avenue
St. Louis 10, Missouri

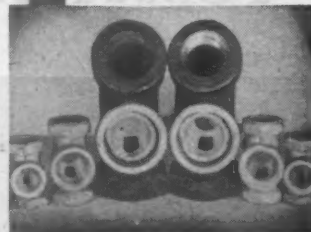


EX-CELL-O

RAILROAD REPAIR EQUIPMENT

PAYS FOR ITSELF IN ONE YEAR!

By using an Ex-Cell-O Precision Boring Machine for the repair of air brake parts, one leading railroad shop increased output 150%. In addition, the former practice of scrapping 50% of worn parts was eliminated. Savings realized in one year more than offset the cost of the machine . . . This is just one example of how the efficiency of your shop can be increased economically with Ex-Cell-O repair equipment. Ask your Ex-Cell-O representative for complete details or write direct.



Above: Cut-out and angle cock bodies, re-bored with Ex-Cell-O Precision Boring Machine, wear as well as new parts. Previously, repaired parts gave only brief, inefficient service.

45-63

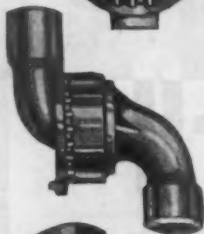
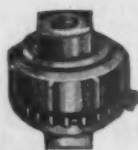
EX-CELL-O CORPORATION

Detroit 6, Michigan

FLEXO JOINTS ~



for all steam pressures to 1350 pounds



Standard FLEXO JOINTS are made of bronze and designed for working steam pressure of 250 lbs., however, we can furnish them for any pressure up to 1350 lbs. superheated steam. They will also carry water, compressed air, gas, oil and other fluids equally satisfactorily. FLEXO JOINTS have proven their ability to give unsurpassed service and they are as durable as they are efficient as they will outlast the pipe to which attached. They are simple in construction as there are no springs or small parts to lose or ground surfaces to wear. All moving parts are entirely enclosed and fully protected from dirt and grit. Their sturdy and practical design is responsible for the perfect service they give. FLEXO JOINTS are easily and quickly installed, have long life, nominal first cost and extremely low maintenance cost. They are used wherever a flexible or swing pipe joint is required to convey steam, compressed air, water, oil and other fluids through pipe lines that must be moved or swung in different directions or to supply machinery or equipment with any fluid while in motion. Try them; know how inexpensive and efficient they are.

4 styles (as illustrated)—iron pipe sizes to 3 inches. Order from your regular supply house or direct from

FLEXO SUPPLY COMPANY, Inc.

4223 Olive Str.

In Canada

S. A. ARMSTRONG, LTD.

115 Dupont Str.

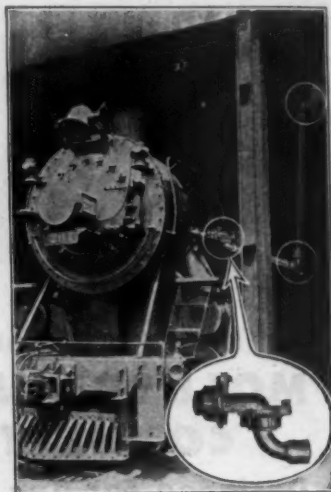
St. Louis (8), Mo.

Toronto (5), Ont.

FLEXO



Just 4 Parts!



Locomotive blower line made up of pipe and FLEXO JOINTS. The flexibility of hose—the safety of pipe.

C-F

POSITIONERS



Where a "Quick Change" is Needed

In production welding, which means working on top, bottom and on all sides of the weldment, a "Quick Change" of position is necessary for greater time saving, greater efficiency, greater safety to men and materials, and with resulting **LOWER COSTS**. A C-F positioner will do all this at the press of a button, without crane help or handling crews—it will rotate a full 360° at variable speeds from 0 R.P.M. up, tilt to 135° beyond horizontal, and permits welding, down-hand, all sides, surfaces and angles in the one set-up with larger rods and fewer passes. All C-F positioners are pedestal mounted for maximum floor and work space—all are adjustable for height.



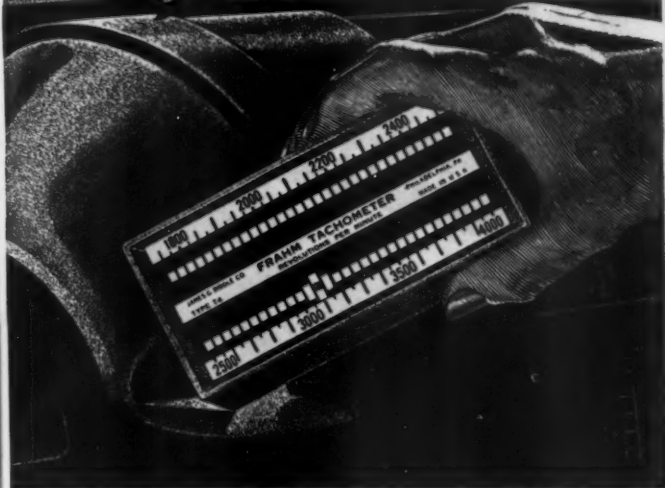
Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.

1324 South Kilbourn Avenue

Chicago 23, Ill.

TO MEET MANY HAND TACHOMETER REQUIREMENTS



The **FRAHM VIBRATING-REED HAND TACHOMETER** requires no contact with the rotating element and is unique for measuring speed of totally enclosed machines and other equipment where the end of the shaft is not accessible. The only mechanism is a set of accurately tuned steel reeds which vibrate by resonance according to the speed of the machine with which the instrument is held in contact.

For hand use in servicing, installation and maintenance work; also built in types for permanent mounting. Various ranges available from 900 to 30,000 r.p.m.

Write for descriptive Bulletin 1590-X.



◀ The JONES HEAVY DUTY HAND TACHOMETER

is used for indicating r.p.m. and surface speeds of all types of machinery in which the moving parts are readily accessible. Simple, rugged and reliable, it is built to maintain accuracy in hard, everyday service. Single and triple range models up to 12,000 r.p.m. supplied complete with carrying case and accessories.

Write for descriptive Bulletin 1710-X.

▶ The JAEGER SPEED INDICATOR

is a "vest-pocket" speed-measuring device which adds up the number of revolutions over a period of six seconds and shows the revolutions per minute without any calculations. Can also be used to measure speeds in feet per minute. Available in two models—for all speeds up to 2000 r.p.m. and for all speeds up to 10,000 r.p.m. Supplied complete with carrying case and accessories.

Write for descriptive Bulletin 1750-X.

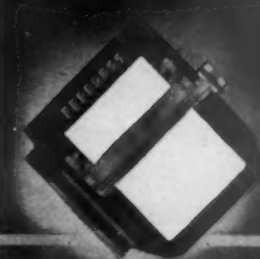


JAMES G. BIDDLE CO. • 1211-13 ARCH STREET
PHILADELPHIA 7, PA.

May, 1945

PEERLESS HYDRA-CUT

THE *Power Saw*
WITH
4-SIDED
Saw-Frame



The B-32 Dominator Bomber is a specialty at the Fort Worth Plant of Consolidated Vultee.

Consolidated Vultee

THIS busy producer of aircraft cuts billets and large bar stock the fast, accurate way — with a POWER SAW!

SAWING off test samples for inspection purposes is number one method as approved by government engineers. SAWING does not heat and harden the metal at the face of the cut. The cool-running, straight-cutting blade removes as little as 1/16" of the precious metal. Peerless Saws cut accurately to the tolerances required in our vital airplane production.

SAWING, the Peerless way with the Four-Sided Saw-Frame and Backing-Plate Blade-Support is an interesting story—told in a simple, pictorial way in a new bulletin, number HC-50. A note on your letterhead will bring a copy to you.

Dealers in all principal cities
Address Dept. RM-545



**PREVENT COSTLY DELAYS AND POSSIBLE DAMAGE TO ENGINES
WITH AMERICA'S MOST WIDELY USED DIESEL NOZZLE TESTER**

ADECO NOZZLE TESTER

*Keeps Diesel Engines
Running Efficiently*



**TESTS FUEL INJECTORS
AND HYDRAULIC DEVICES
At Pressures Up To
10,000 p.s.i.**

To keep diesel engines operating at peak efficiency, this portable, precision-built Adeco Nozzle Tester is indispensable.

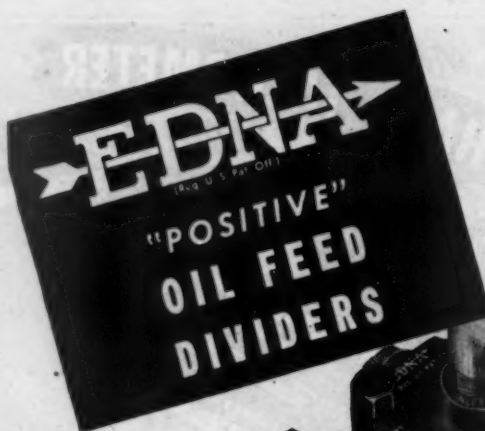
Light in weight yet built for heavy-duty service, it enables any mechanic to make quick, accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Tests both large and small injectors, on bench or engine, at pressures up to 10,000 p.s.i. Prevents costly delays and possible damage to engine.

Ideal for testing hydraulic devices.

Write for bulletin on this practical, low-cost unit.

**AIRCRAFT & DIESEL
EQUIPMENT CORP.**

4411 NO. RAVENSWOOD AVE.
CHICAGO 40, ILLINOIS



2

to

8

Outlets

*Entirely Eliminates
Hand Oiling*

The EDNA Positive Oil Feed Divider now makes possible far greater efficiency in automatic division and distribution of lubricants to all machinery points. Multi-Feed Dividers eliminate the number of active lubricator feeds required, reduce the quantity of pipe needed for any application. Lubricant flows freely up to 10,000 lbs. pressure per square inch! And in extremely cold weather operates with complete efficiency. Priced from \$17.50 to \$43.50. For further details and list of railroads now using Edna Dividers, write for Bulletin No. A-101A.

REPAIRS

NONE

CLEANING

NOT
GENERALLY
REQUIRED

INSPECTION

NONE

MAINTENANCE

NONE

POSITIVE

Dependable operation.
Works against steam or
atmospheric pressure.

FLEXIBLE

Available in unlimited
number of practical
combinations to divide
and deliver lubricants
to any points and in
any quantities.

ECONOMICAL

Because of high quality
of materials and simple
design, requires no
maintenance. Initial
cost is lost cost.

FORCE FEED LUBRICATORS
"POSITIVE" OIL FEED DIVIDERS
AUTOMATIC AUXILIARY LUBRICATORS
HYDROSTATIC LUBRICATORS • OIL CUPS
LIFTING and NON-LIFTING INJECTORS • BOILER CHECKS
VALVES • COCKS: CYLINDER — GAUGE — TANK
REFLEX WATER GAUGES • WATER COLUMNS
"EDNALOY" CASTINGS

THE EDNA BRASS MFG. CO.

Sales Agent of National Lead Company

525 READING ROAD

CINCINNATI 2, OHIO

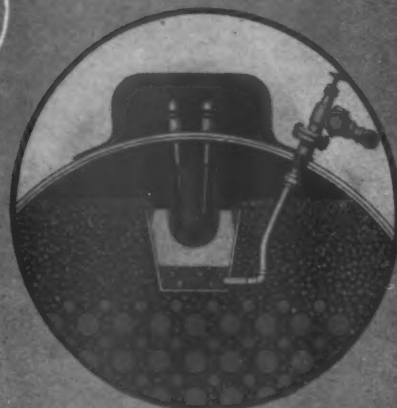
Bubbles in the Dry Pipe

SLOW UP MIGHTY LOCOMOTIVES

Foam and high water—threats to the dry pipe and locomotive efficiency—are automatically trapped by the Electromatic Foam-Collapsing Blow-off System.

With this modern system of precision control, expanded water spills over into a trough under the dry pipe when it reaches a dangerous level. Contaminated water, oil, and floated suspended matter are automatically blown off, thus depressing the foam level and assuring a clear steam channel to the dry pipe.

The system also provides visual indication in the cab of the foaming condition of the water in the boiler at all times. Write for details.



Cross-section view illustrates how foam collapsing trough, installed under the steam dome, traps collapsed foam and how electrodes automatically control blowdown.

Electromatic
FOAM-COLLAPSING BLOWOFF SYSTEM

Electro-Chemical Engineering Corporation
Subsidiary of Dearborn Chemical Company
310 S. Michigan Ave., Chicago 4, Ill.

Car Specialties



All Standard Type Spring Plates produced for your requirements.

by Motor Wheel

Defect Card Holders made of heavy gauge, pressed steel construction.



Weatherproof. Large opening for convenient access.

The Above Equipment Fully Meets A.A.R. Requirements

T-Z RAILWAY EQUIPMENT CO., Inc.

8 SO. MICHIGAN AVE.,

CHICAGO 3, ILL.

National Railway Sales Representative

Motor Wheel Corp., Lansing 3, Mich.

Progressive Feed

the only correct metal-cutting principle



comparison proves

1. Proper Design — Based on nearly forty years experience in the art of metal cutting.
2. RACINE Machines meet accepted standards of the machine tool industry.
3. Easy to handle—Single lever control of all operating functions.
4. Hydraulic operation and control permits rugged construction—Economic production results.

PROPER application of the cutting tool is vitally important in sawing machines. That is why RACINE pioneered, many years ago, positive, progressive feed throughout the cutting stroke. This is still an exclusive RACINE feature.

Progressive Feed has these advantages. Undue strain is avoided. Each tooth is made to act like a parting tool. More metal is removed on each cutting stroke. That is the reason RACINE Machines cut faster and more accurately.

RACINE Hydraulic Machines incorporate a Dual (positive and flexible) Feed Control. Under positive feed the depth of cut is predetermined in every type of stock. Flexible feed enables the blade to cut faster in round stock and the lighter sections of tubing and shaped materials. Dual Feed is exclusively RACINE.

These scientifically accurate, fast cutting machines are available in four models and all capacities from 6" x 6" to 20" x 20". Write for catalog No. 12. At the same time outline the cutting work you have to do. Our engineers will recommend the best machine for the job.



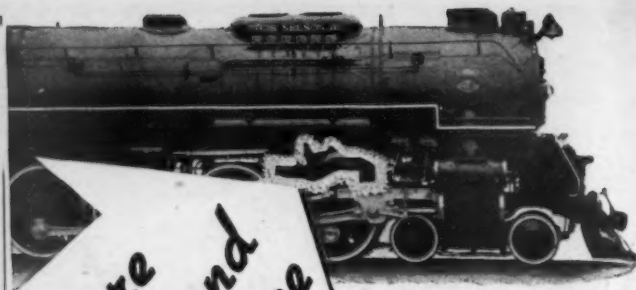
RACINE "Variable Volume" Oil Pumps A Modern Source of Hydraulic Force

RACINE Oil Hydraulic Pumps in three capacities: 12, 20 and 30 G.P.M. provide from zero to full capacity without relief valves. They operate at pressures from 50 to 1000 lbs. P.S.I. Ask for catalog P-10-C.

RACINE TOOL AND MACHINE COMPANY
1740 State Street Racine, Wisconsin, U. S. A.

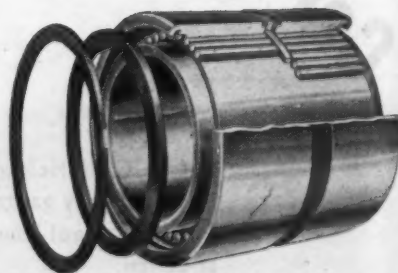
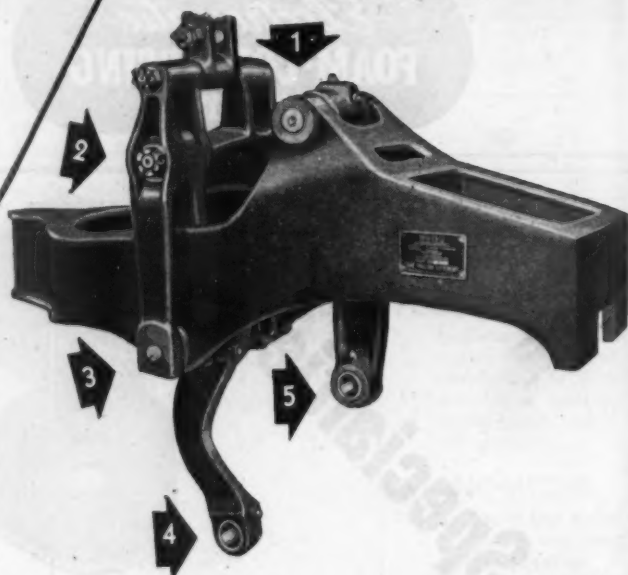


RACINE



More
Mileage and
Less Maintenance

The new, improved Baker Valve Gear, when equipped with McGILL MULTIROL Bearings, gives greatly increased mileage and requires less maintenance. The solid-end, full length rollers in McGILL MULTIROL Bearings have much greater load capacity than ordinary rollers. Lubricating costs are reduced, replacement of worn pins and bushings are eliminated, and mileages of 500,000 and more without maintenance are reported.



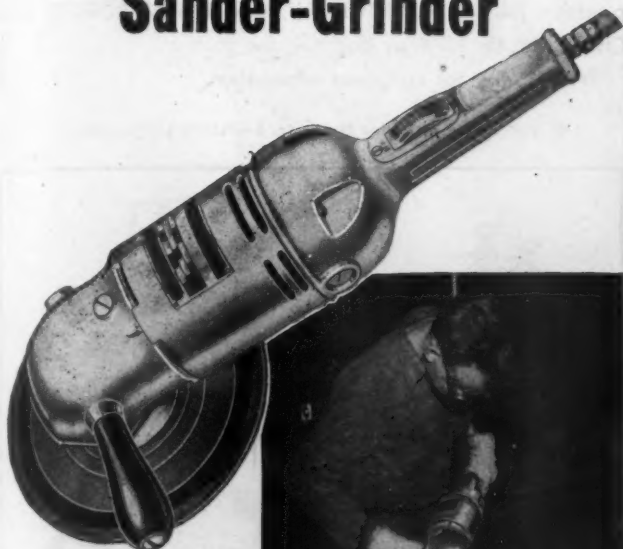
Bearings can be made to suit your own special requirements. Write the McGILL Manufacturing Company, Inc., Valparaiso, Indiana, for information.

THE PILLIOD COMPANY

Factory—Swanton, Ohio

30 Church St., New York, N.Y.—310 S. Michigan Ave., Chicago, Ill.

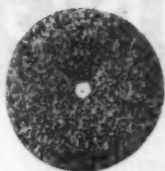
DO THE JOB with a Stanley Sander-Grinder



STANLEY
No. 72 - 7" diameter disc
No. 92 - 9" diameter disc



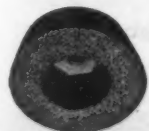
USE IT WITH ANY OF THESE!



SANDING DISC
For grinding or
sanding any flat
or curved surface.



WIRE BRUSH
For cleaning
tanks, vats, cast-
ings or sheet
metal



**CUP GRINDING
WHEEL**
For smoothing
welds or taking
down metal

All operations from rough finishing to final buffing can be handled economically with Stanley Disc Sander-Grinders and their multi-purpose accessories.

Smooth, clean-cut design makes them easy to use in close quarters. Plenty of power for continuous operation without over-heating. Seal-type ball bearings take side and end thrust. Spiral bevel gears assure long life and smooth operation.

Spot a few of these tools around the shop. They will cut costs on many jobs. Ask for demonstration or literature. Stanley Electric Tools, Division of The Stanley Works, New Britain, Conn.

STANLEY
Trade Mark



**STANLEY
ELECTRIC
TOOLS**

SPEER CARBON BRUSHES ARE TROUBLE CHASERS in Motors and Generators



Equip your d.c. and slip ring motors, generators, and other commutating machines with Speer Carbon Brushes and watch them perk up. More and more users are finding that Speer brushes give utmost freedom from burning, overheating, sparking, excessive wear and energy losses, and other brush troubles that decrease operating efficiency, cause extra maintenance.

Good brush performance calls for brushes that are matched—electrically and mechanically—to the characteristics and service conditions of each machine.

Matching brushes to machines has been one of Speer's specialties for nearly 50 years. From its all-inclusive selection of standard and special carbon, graphite, electro-graphite and metal-graphite brushes, Speer can supply the grade that will mean peak performance, fewer brush renewals and less maintenance on any application.

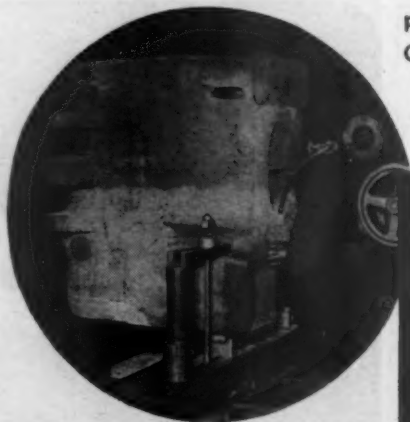
So, if you want to be sure of trouble-free brush operation, switch to Speer. You'll get sound practical advice, plus quality brushes matched to your machines. See your favorite supply house or electrical contractor, or write direct for Brush Data Forms.



CHICAGO • CLEVELAND • DETROIT
MILWAUKEE • NEW YORK • PITTSBURGH

UNIVERSAL BORING MACHINE FEATURES INSURE PRODUCTIVE CAPACITY AND ACCURACY

- ① Three Bed Ways—span 44 inches.
- ② Table Semi-Box design, heavily ribbed.
- ③ Motor mounted directly on base.
- ④ Saddle lead screw not mounted between guiding ways.
- ⑤ Centralized right hand control.
- ⑥ Heavy duty type—heaviest 4" spindle machine built.
- ⑦ One shot lubrication for head, also for saddle and table assembly.



UNIVERSAL

BORING MACHINE COMPANY
HUDSON, MASS., U. S. A.

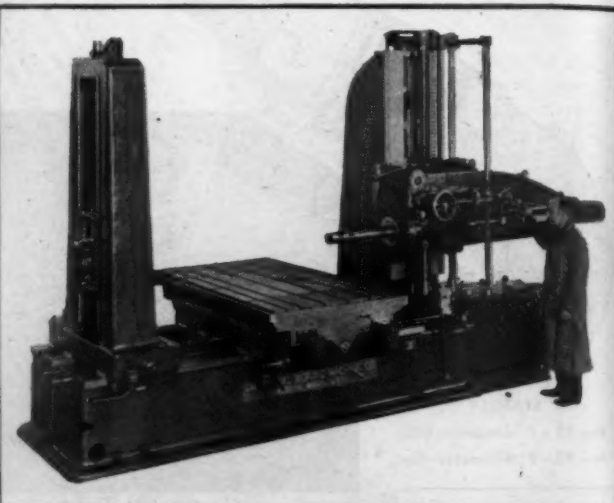
Railway construction and maintenance shops will find the UNIVERSAL BORING MACHINE a welcome addition, because of its versatility in precision machining operations.

This improved UNIVERSAL BORING MACHINE is available in 4" and 5" spindle sizes. Both are readily adaptable to do many boring, milling, turning, facing, recessing, and threading operations.

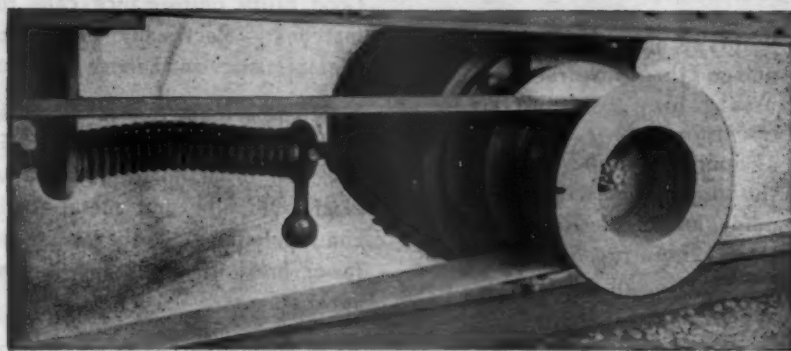
And UNIVERSAL can also show you how to handle many more precision jobs on a UNIVERSAL HORIZONTAL BORING MACHINE with the Tri-Way bed.

Write today for complete information.

◀ Milling Diesel Engine Frame for Switching Locomotive.

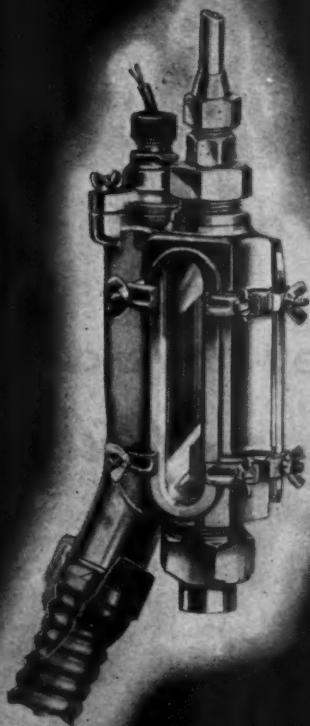


VEELOS *Balata* BELTING



- Minimum Stretch
- High Coefficient of Friction
- PROVEN Low Car-mile Cost
- High Tensile Strength
- Stronger Fastener Anchorage

MANHEIM MFG. & BELTING CO.
NEW YORK OFFICE: 50 Church St. MANHEIM, P.A. CHICAGO OFFICE: 407 S. Dearborn Street



Okadee SAFETY

Water Glass Protector

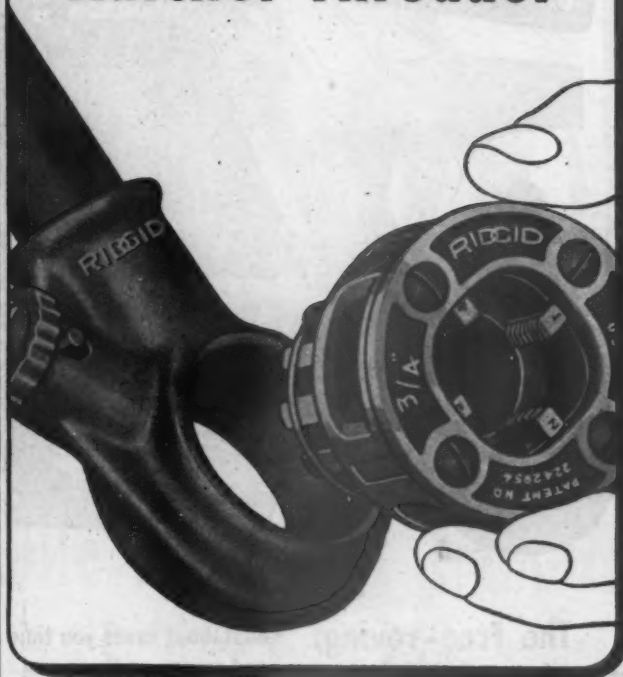
The safe operation of a locomotive requires constant observation of the water level in the boiler. A gauge glass clearly indicating the water level from the position of both the engineer and fireman in the cab is essential to safe operation. A well protected and properly illuminated *tubular* water glass offers the safest and most accurate method for reading the water level.

The Okadee Water Glass Protector has these features: It is steam and water tight... provides clear vision... illuminates full length gauge glass... is economical to maintain and provides complete safety for the enginemen.



THE **OKADEE** COMPANY
332 SOUTH MICHIGAN AVENUE, CHICAGO

You'll enjoy using this smart little **RIGGID** Ratchet Threader



Die Heads lock in either side

• This 111R threader is a time-saver on pipe from $\frac{1}{8}$ " to $1\frac{1}{4}$ ". Click the size die head you want into the ratchet ring, from either side. No special dies needed for close-to-wall threads, just reverse the alloy steel chasers, easily removed also for regrinding. You'll like this efficient rugged little steel-and-malleable threader—ask your Supply House. We're trying our hardest to meet the big demand for

RIGGIDS... your patience is greatly appreciated.



♦ Handycarrier with any combination of sizes.

RIGGID

WORK-SAVER PIPE TOOLS
THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U.S.A.

ROUSTABOUT CRANE



The Free-roving, Tractor-footed Crane of a hundred uses

● Post-war competition will demand greater efficiency and lower costs. That means the speed and economy of machine power — like this Roustabout Crane. Ready where needed, it moves, loads, stacks heavy stuff to 7½ tons all around your plant, prevents costly delays. Easy to operate, built for years of overwork — ball-bearing boom turntable, all gears in oil. It pays you to get the facts *now* on this fast-action mobile wheel or crawler crane.

Roustabout saves you time and money on these and many other jobs

- Big stuff off and on trucks, freight cars
- Moving large machines
- Handling bales, boxes, drums
- Moving big castings, motors, railroad and marine gears
- Loading air transport planes
- Handling tanks, pipe, structural steel
- Installing heavy valves and fittings



THE HUGHES-KEENAN COMPANY
605 NEWMAN STREET • MANSFIELD, OHIO



Roustabout Cranes

By Hughes-Keenan

Load-Handling Specialists Since 1904

*Speaking of
Manpower—*

men do more work
in less time
if they have a

Wells No. 8—



SPECIFICATIONS: WELLS No. 8

CAPACITY:
Rectangular 8" x 16"
(Special Guides) . . 5" x 24"
ROUNDS: . . 8" diameter

MOTOR:

½ H. P., A. C. or D. C.

SPEEDS: Selective 60,
90, 130 feet per minute

WEIGHT: Approximately
750 pounds

● Today's production schedules and manpower shortage make it necessary to provide workmen with every possible means of saving time and labor . . . and that's where Wells No. 8 Metal Cutting Band Saws fit into the picture.

They can be used as auxiliary equipment to eliminate the bottleneck at big saws. They reduce time-wasting movement of stock—instead, you move a Portable Wells to the job. Set-up and change-over time are saved by their simple operation and quick acting vise. On production cut-off jobs one man can operate 2 or more Wells saws. There is a spot in *every* metal-working plant for a Wells No. 8.

Wells saws

Wells

Products by Wells are Practical

**METAL CUTTING
BAND SAWS**

WELLS MANUFACTURING CORPORATION
1616 POLK STREET, THREE RIVERS, MICHIGAN

RAILWAY MECHANICAL ENGINEER

HALL

WET TYPE

DIESEL VALVE REFACER

•
DUPLICATES
ORIGINAL
FACTORY
PRECISION
and FINISH
•

THE HALL
MANUFACTURING CO.
TOLEDO 7, OHIO

Model 80-A

Special type COLLET holds valve stem securely without brinelling or marking stem.

WET GRINDING prevents surface burning and stem growth; produces finer finish.

Handles valves to 5" head dia.

MICROMETER WORKHEAD FEED CONTROL Operator knows exact amount of metal being removed.

MASTER MOTOR SWITCH and CUTOFF SWITCH

RHEOSTAT CONTROL adapts Workhead speed to valve dia.

QUICK-ACTING CHUCK LOCK for quick, easy insertion or removal of valve.

FULL BALL BEARING SPINDLE insures smoother operation.

GRINDING WHEEL MOTOR

WORKHEAD MOTOR

DOVETAIL TYPE WAYS accurately machined. Spring-loaded bronze gibs compensate for wear.

Write the factory or consult your HALL jobber for complete information on the 80-A Refacer.

15 Minute Hydraulic Valve and Cylinder BUSHING APPLICATOR

For Locomotive Valve and Cylinder Bushings

Will apply either cylinder or valve bushings in 15 minutes. . . . Portable, compact, lightweight, easily set up and operated by one man, it eliminates the need for heating cylinders and using power wrench. Consists of 60-ton capacity bushing applicator, and oil-operated, four-speed hydraulic hand pump, equipped with pressure-measuring gauge, accurately controlled and quickly read by operator. Applies both valve bushings simultaneously.

Also applies side rod bushings and driving box brasses.

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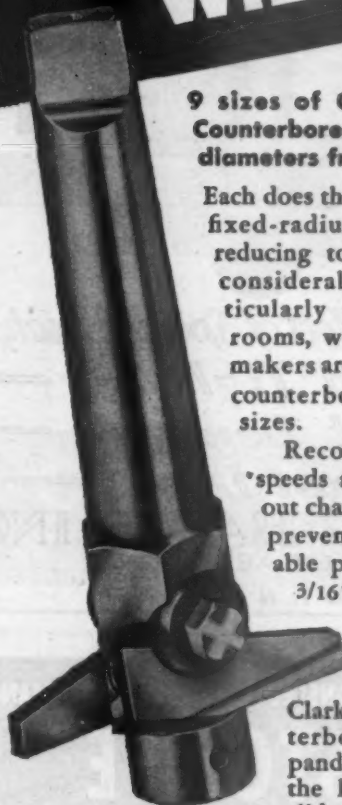
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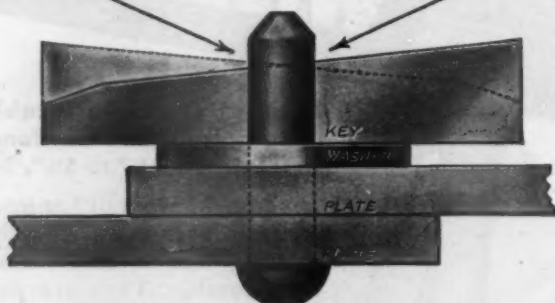
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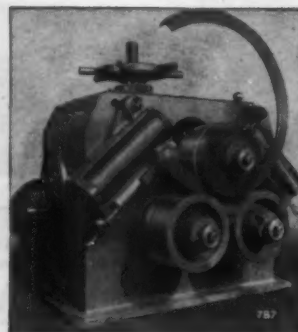
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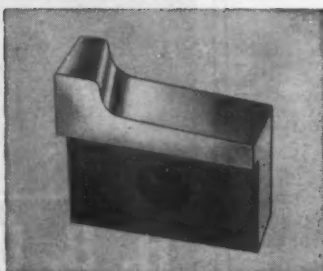
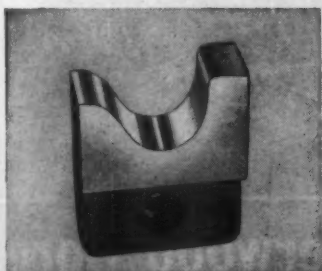
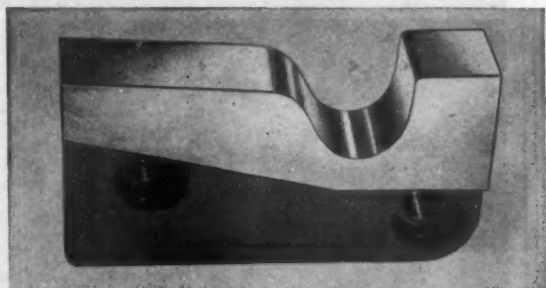
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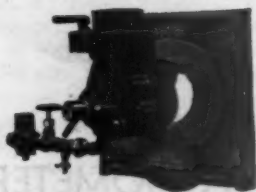
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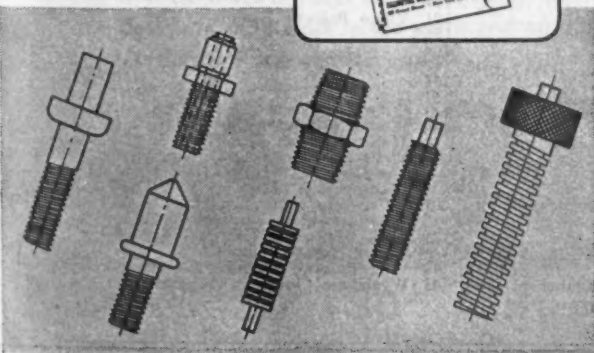
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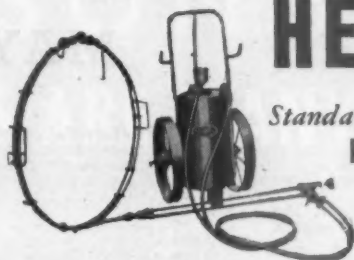
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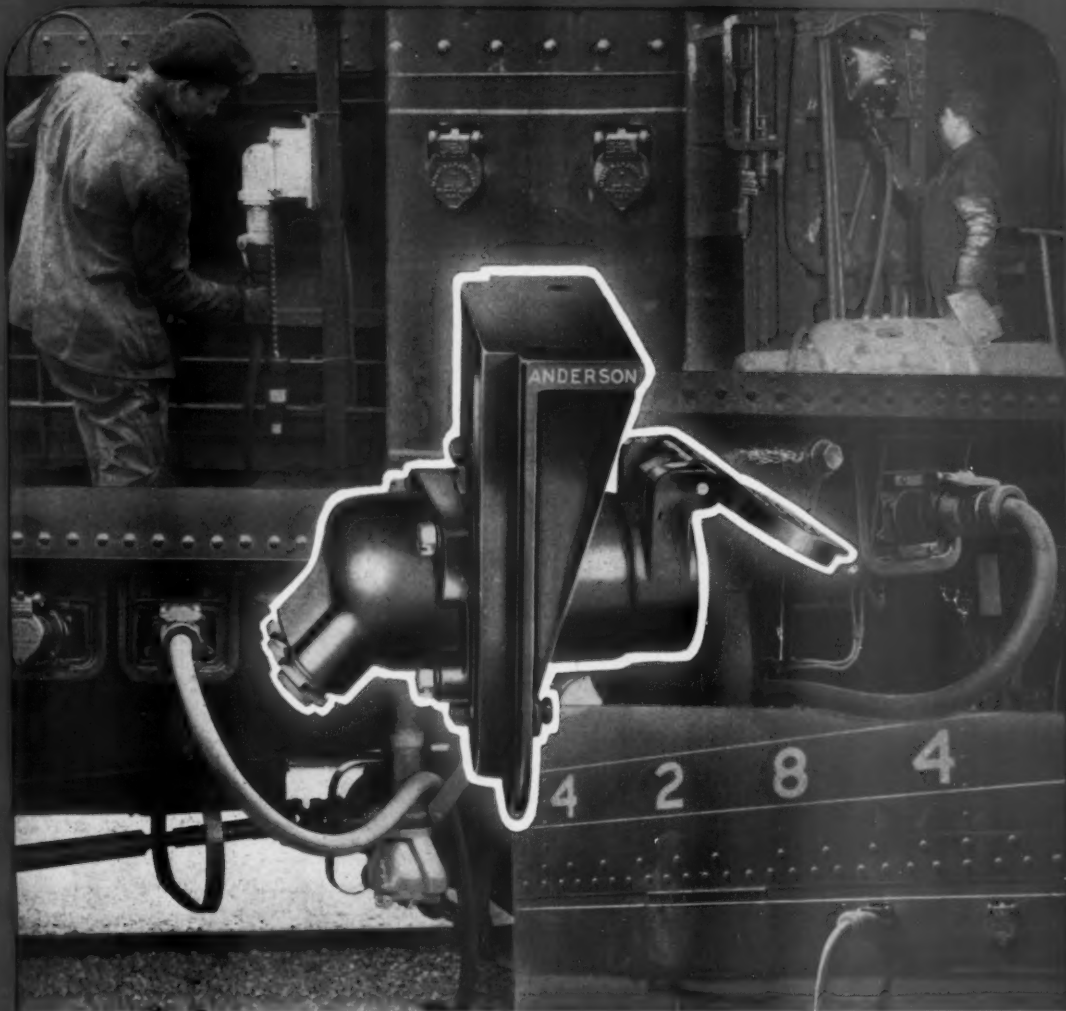
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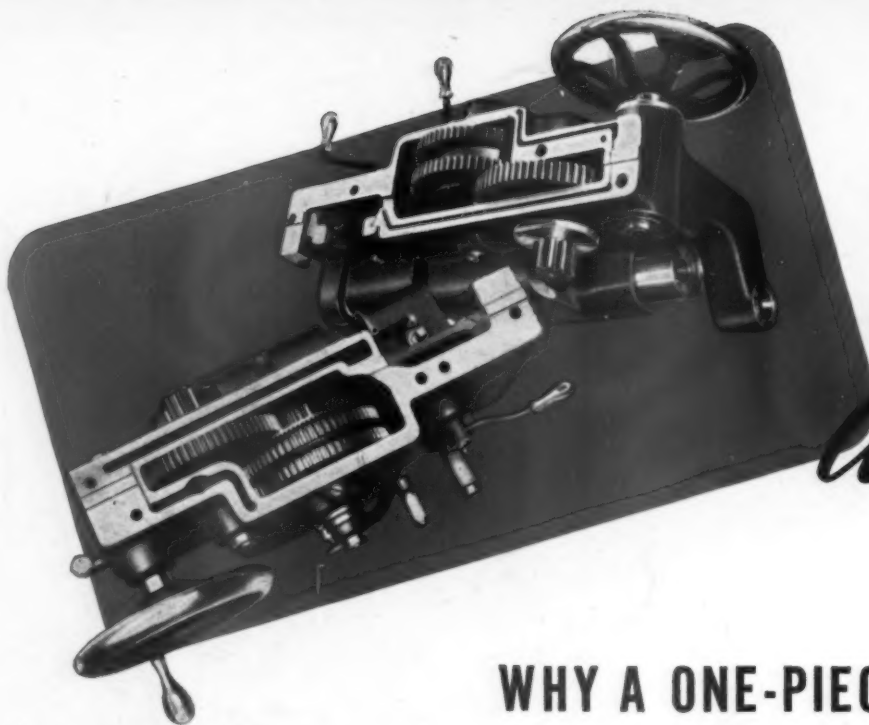
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